MODEL AIRPLANE NEWS

MAY 1947

TWENTY-FIVE CENTS

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MODEL AIRPLANE COURSE for BEGINNERS . . *PAGE 22*

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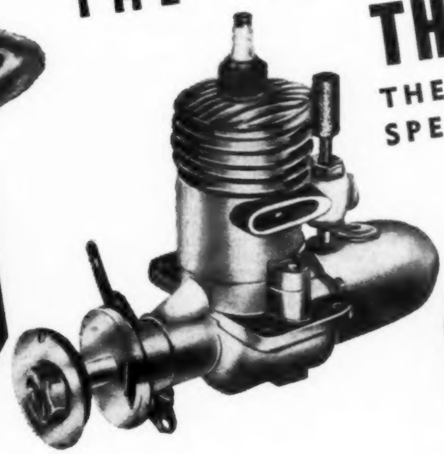

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MODEL AIRPLANE NEWS

JAY P. CLEVELAND
Publisher

MAY, 1947 VOL. XXXVI No. 5

CONTENTS

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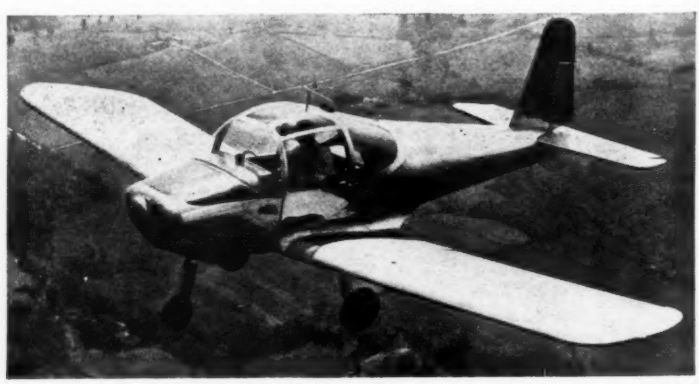
NEW AIRCRAFT, fruition of the creative war period, continue to be revealed. Most of the types announced since V-J Day were launched during the war to meet the tactical problems of the war in the Pacific, but the inflexible demands of development time are working overly long on new, radical aerodynamic and propulsion advances. The Martin XP4M-1, first land based Navy patrol plane designed for jet engines, is revealed as conventional mid-wing monoplane with tricycle landing gear and single tail surfaces. It is powered by composite units mounted in a single nacelle in each wing. Each nacelle houses a Pratt & Whitney *Wasp Major* reciprocating engine and an I-40 turbojet unit of General Electric design manufactured by Allison Division of General Motors Corp. Air intakes for the jet engines are located below the reciprocating engine housing. The main gear folds outboard into the wing. Remote control dorsal and ventral turrets are carried together with a multi-gun turret in the extreme tail. The giant craft carries up to 8000 lbs. of bombs and has a range of nearly 3000 miles at cruising speed of about 200 mph.

THE NORTHROP YB-49 appears, at this date, as the ultimate form of the flying machine: the jet powered flying wing. The YB-49 is an XB-35 configuration powered by 8 General Electric TG-180 axial flow turbojet units, mounted in close groups of 4 in each outer wing panel. Vertical fins are mounted one on either side of the tail pipes, a total of 4 in all. These are termed "air separators" rather than fins because they are not used to obtain directional stability as are the latter. The high velocity efflux from the banks of jets induce a flow of air from the surrounding region into the jets, resulting in spanwise airflow towards the jets along the wing trailing edge inboard from the tips and outboard from the wing centerline. These fins inhibit this "inflow" and preserve the pressure distribution over the airfoil. The YB-49 is ready for engine installation and is expected to be flying by summer.

CONSOLIDATED VULTEE XB-46, America's first jet bomber and one of the "cleanest" aircraft ever designed, has been announced. It is a *Liberator* sized bomber powered by 4 General Electric TG-180 axialflow turbojet engines, mounted in pairs in streamlined nacelles with common air intakes and jet tailpipes. The extremely slim fuselage and thin, high aspect-ratio wing give the XB-46 a razor sharpness in appearance. Wingspan is 113 ft., length 105 ft. 9 in., and it is expected to be in the 500 mph class. It is now undergoing ground tests at San Diego with first flight expected momentarily. The North American XB-45 is similar in appearance and was designed to the same basic specification.

DOUGLAS D-558 received public announcement and first photographs indicate the craft is true to its *Skystreak* name. It is powered by a General Electric TG-180

(*Turn to page 6*)



Above Aeronca Chum, a spinproof 2 place personal plane, has 115 mph top speed and 85 hp engine. Below Piper Skysedan, all metal 4 place experimental ship, is a radical departure from the usual Piper line

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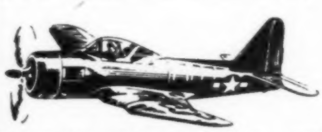
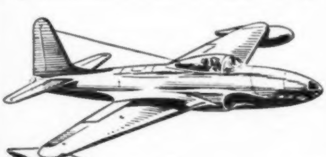


Navy's Dual-Propelled Ryan "Fireball" 30 ¾" $3.50



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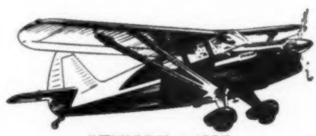
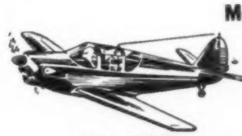


STINSON "150"

McDonnell "PHANTOM"

CULVER "V"



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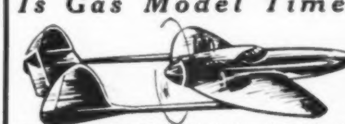

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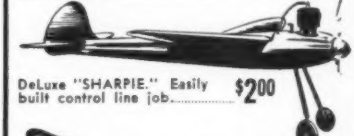

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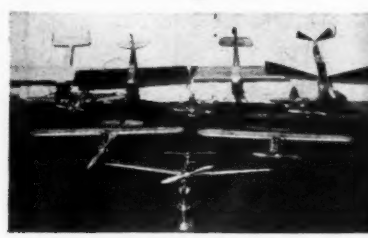

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SUPER-CYCLONE—The biggest name in little engines

(Continued from page 2)

turbojet and is thus a service type aircraft capable of taking off and taxiing under its own power. It is another in an extensive series of sonic research airplanes being built by the services for tests by the NACA. Others in the series include the now famous Bell XS-1, Bell XS-2 and the Northrop "delta wing" XS-4. The Army version of the D-558 is the XS-3, although it is not known how similar the two aircraft are to be. A special feature of the D-558 is the pilot safety equipment including a jettisonable nose which, following separation from the fuselage, slows down in flight permitting the pilot to parachute to safety. First test flight is scheduled at Muroc Army Air Base shortly.

WHILE BRITAIN forges ahead in its leadership in aircraft gas turbine development, Rolls-Royce Ltd. announces a new reciprocating engine, the Rolls-Royce *Eagle*, developing 3500 hp. The liquid cooled engine is of the "H" type with four banks of 6 cylinders. The *Eagle* is being tested in a new Westland aircraft of undisclosed type.

EXISTENCE of torrid layers of air in the upper atmosphere has been revealed by NACA. It had previously been believed that the temperature dropped steadily from sea level up to about 35,000 ft. where it became a constant —67° on up into the stratosphere. The new NACA "standard atmosphere" reveals that the air begins to grow hot again at about 105,000 ft., and at 165,000 ft. the temperature gets as hot as 220° F. It then grows cold again up to about 260,000 ft. where the temperature is as low as —160° F. Then another hot layer begins with the temperature getting up to 212° F at about 400,000 ft., which is the limit of the present studies. These new findings will demand extensive changes in the design and construction of rocket aircraft and missiles intended for operation at these heights to accommodate these tremendous temperatures.

THE LONG AWAITED Beech 34 transport is revealed as a 20 passenger high-wing monoplane powered by 4 Lycoming engines driving two propellers. The engines lie completely buried within the wing, and each pair drives a single Hamilton Standard 10 ft. 7 in. propeller. The Model 34 has a span of 70 ft. and is 51 ft. long. It will have a gross weight of only 15,000 lbs. and is expected to cruise at 5000 ft. at 183 mph. A tricycle landing gear is fitted and the famous Beech "butterfly tail" is used.

THE BRITISH continue to announce extensions of their overall master plans for future aircraft designs, the latest including a 12-jet, 260,000 lb. flyingboat. Also announced was a 60-70 ton jet landplane. Although early test flights of the *Tudor I* proved so disappointing that British Overseas Airways cancelled their order for 78, the model continues in quantity production for British South American Airways. *Tudor II* models will go to the Ministry of Supply as personnel transports. BOAC has placed orders for the *Hermes* III and the *Hermes* IV, both of which will be jet types. There can be little doubt that the British will rule the jet transport picture two or three years hence. Pan American cancelled their order for Republic *Rainbows*, and Republic stated the type definitely is not scheduled for conversion to jet power, a guess made by many experts. With only the Boeing *Stratocruiser*, the Douglas DC-6 and Consolidated Vultee Model 37 scheduled for production, none of which have the remotest application for jet power, the outlook for a jet American transport within the next five years is dim indeed. The merits of a jet transport are another question, however!

FIRST FLIGHT of the radical French Leduc O-10 was made successfully. The first French jet, the tiny craft was borne aloft "piggyback" style by a transport and released in midair.

PRODUCTION on the Martin AM-1 *Mauler* bomber-torpedo planes is well under way with the first two aircraft completing flight test work preliminary to delivery to the Navy. Figures are now available on the giant 21,000 lb. craft including its top speed of more than 350 mph. It has a span of 50 ft. 1 in. and is 41 ft. 6 in. long. The *Mauler* cruises at 280 mph and has a service ceiling of better than 25,000 ft. It can carry two 2000 lb. torpedoes or an even greater weight of depth charges or bombs. A total of 75 are due for delivery, with the first group going to the Pacific Fleet and a second group to the Atlantic Fleet.

ARMY AIR FORCES announced a liquid oxygen converter, a longtime goal of engineers because of the small container and simplicity of supplying crew members oxygen from a liquid supply during high altitude flights. The device, developed by Bendix Aviation, provides 45% more oxygen and weighs 67% less than the standard oxygen bottles and supply system. Principle of the converter is the release of liquid oxygen into an evaporating coil. Because it boils at —270° F, the liquid oxygen is converted into the gas through expansion of the evaporator circuit and passes through an automatic check valve into the supply system.

HARD ON THE heels of Dr. Luis Alvarez' gloomy prediction of the practicality of atomic energy for aircraft comes the announcement of NEPA (nuclear energy for propulsion of aircraft), a joint project of AAF, NACA, the Federal Government's Oak Ridge project and numerous aircraft companies. It is generally understood that this project is designed to produce an atomic energy guided missile which would make heavy shielding for a pilot unnecessary. Basis of the project is the fact that one kilogram of U-235 can release energy the equivalent of 30,000,000 hp. The prime contractor is Fairchild Engine and Airplane Co. in cooperation with Oak Ridge. Other aircraft companies include: United, Wright, Continental, Allison, Lycoming, Frederick Flader, Northrop, Menasco and Westinghouse. Maj. Gen. Curtiss LeMay is in charge of the project which is being financed from AAF funds.

On the basis of studies already published and the general activities of the firms involved, it would appear that the basic aim of the project is to develop a turbine operated by the heat from nuclear fission. Other possibilities are: closed-cycle turbines, open-cycle turbines (heat from an outside source), ramjets and rockets. Work is already well under way at the Cleveland Laboratory of NACA, the Frederick Flader Research Organization, and Massachusetts Institute of Technology.

SUBSEQUENT TEST flights of the Bell XS-1, rocket-powered research airplane, revealed control difficulties which have forced those associated with the project to become pessimistic of the craft ever reaching sonic speed in level flight. Although the power available and the drag of the aircraft make it theoretically capable of speeds much higher than this, severe control difficulties have developed at fairly low speeds (500-600 mph) which grow progressively worse as speed is increased. Meanwhile, engineers become more expectant that the Douglas D-558 will prove much more satisfactory due to its service-type powerplant and its many safety features.

HAMILTON STANDARD has developed an electrically heated propeller covered with 3 ply rubber padding about 1/10th of an inch thick into which tiny wires are woven. By running current through these wires for 20 seconds, followed by a 60 second lapse, ice is effectively removed from the whirling blades. The process is also applicable to wing and tail leading edges at a fraction of the weight and complexity of the existing air pressure de-icing system.

RETURN OF THE "tiny mite" racing airplanes to the National Air Races, although in more rigidly controlled and stronger form, is heralded by the announcement of a 190 cu. in. short-course lightplane event for the Races this year. The rules include a maximum wing loading of 12 lbs. per sq.ft., strength for a 6-G pullout, fixed landing gear, no flaps and demonstrated satisfactory flight characteristics. About 25 different designs have been registered to date and leading the pack is famed Art Chester, pre-war racing favorite, who has three under construction. The event will be sponsored by Goodyear Tire and Rubber Co.

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10. We don't carry everything—ONLY THE BEST!
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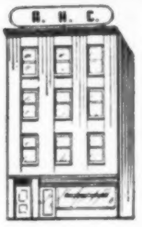

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New Thor	(CL B)	9.95*
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*Includes coil and condenser

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Aero Coil (Quality)	3.00
Smith Competitor Coil	1.95
Arden Coil	2.50
Winston Coil	2.00
Wilco Coil	1.95
Regular Coil	1.50
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Power-plus	
Flight Battery	2.75
Booster Battery	3.50
House Charger	4.45
Auto Charger	1.95
Arden Flight Timer	1.85
Austin Flight Timer	1.50
Comet Flight Timer	1.00
Hillcrest Flight Timer	1.25
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4-Way Plug Wrench	.15
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Spinit Starter	4.00
Aluminum Engine Mounts	.50
Flo-Torque Props (8" to 14")	.50
(16", 18")	1.00
Topping 10" Multi-pitch Prop	1.50
Topping 12" Multi-pitch Prop	1.75
Comet Props: 9", 10", 11"	.35
12", 14"	.40
Hi-Pitch Props: 8", 9", 10", 45c; 11", 50c; 12", 13", 60c; 14", 65c.	
Snafu Plastic Prop 10"	.75
12"	.90
Topping 3 Blade Plastic Props	1.50
Sponge Rubber Wheels 2", 40c; 2 1/2", 50c; 3 1/2", 60c	
Troxler Balloon Wheels 2 1/2" 60c; 2 3/4" $1.00; 3" $1.25; 3 1/2" $1.50; 4 1/2" $1.75.	
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Flywheels A or B, $1.00; C, $1.50	
Univ. Running Stand	1.25
Midget Screw Driver	.10
Hi-Tension End Clips, each	.05
Tip Jacks Set	.60
Plug Gauge Set	.15
Alum. Prop Spinners 5/8", 20c; 3/4", 30c; 7/8", 75c; 1 1/2", $1.00; 2", $1.25; 2 1/2", $1.50; 2 3/4", $1.75.	
Presto Disc Starter	.25
Bamboo paper—white, green, blue, each	.10
Wood Stripper	.25
Celluloid Sheet	.10
Austin Tank	.50
Froom Gas Tank	1.00
Winston Tank	.75

FREE FLIGHT PLANES

(FREE: See item 8 above)

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Buccaneer 48"	3.50
Buccaneer 36"	1.50
Bee 48"	1.95
Brooklyn Dodger 56"	3.95
Pacer B 53"	3.95
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Model Airplane NEWSLETTER

by AL LEWIS

OUR recent column on the return of rubber and the value of rubber powered models attracted considerable interest according to the many letters we have received.

Well, it's like we always said—you can learn more from a good rubber model in one hour than from a powered plane in a week. Sgt. Jesse (Bob) Baugher of Maxwell Field, Alabama backs us up on that statement. He was mighty glad to see that others realize the challenge rubber jobs present to the modeler.

While we were in Chicago, Ed Lidgard of the famed Aeronuts club came up and wrung our hand because we went to bat for the rubber flyer. Ed is an old-timer at all types of models and speaks with authority when he talks of the great knowledge of design, construction and adjustment which is yours for the asking—by just building and flying a few rubber powered jobs before jumping into the gas model field.

And there is plenty of fun in rubber flying, believe us. Take the Oakland, Calif. Cloud Dusters as an example. That club is concentrating on the Wakefield type rubber powered model and is running a series of special events to school members in the art of competing with large rubber ships (200 sq. in. wing area). Not long ago the Dusters held a Wakefield event at Livermore Airport amid squalls of rain. The day was dark, dismal, rainy. At least three Wakefield models were flown in fairly heavy rain. Yet the times turned in were excellent considering the conditions.

Three-flight average top times were as follows: Manuel Andrade, 3 min. 57.6 sec.; Michael Demos, 2:34.6; Carl Rambo, 1:25.7; Gordon Peterson, 0:58.6. Models were processed strictly; all flights were unassisted takeoff. Andrade caught the only break in the clouds and really got upstairs for a good flight of 5 min. 59.6 sec. More is expected from him soon because of his excellent model which has a wing area of 202 sq. in. planform and weighs 9½ oz. Mike Demos got his job up at the same time that Andrade got his away. Mike's was considerably higher when his tensioner cut in, and knots in the tail of the ship brought it down in a hurry.

We mention this in an effort to convey our belief that rubber models are fun to build and fly, and that everyone who goes on to gas modeling is a better flyer because of his experience with rubber powered craft.

Along these lines we might mention that open warfare is expected any day now between the East and West—or between the control line and indoor rubber model forces—since our friend Frank Greene of Los Angeles really set the Eastern indoor experts on their ears with a statement to the effect that "indoor models are the least scientific of all types." Naturally, the indoor proponents contend that you can fly a barndoor on the end of a string if given enough power—so the argument goes. Mighty interesting.

A MOMENT AGO we mentioned speaking to designer Lidgard in Chicago. That was during the recent Model Industry Trade Show. Perhaps you'd like a quick review of impressions gained out there—

In the matter of kit models we counted more than 30 new control line kits already in production or announced. Only two new free flight jobs were exhibited at the affair. But don't sell free flight short. Ray Acord, from the West Coast, reported increased interest along those lines as did others from that section of the country.

(Turn to page 10)

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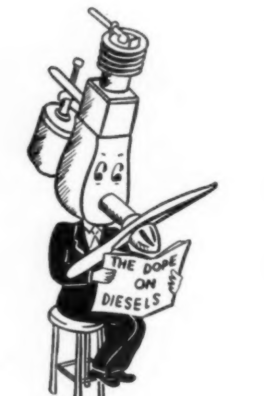
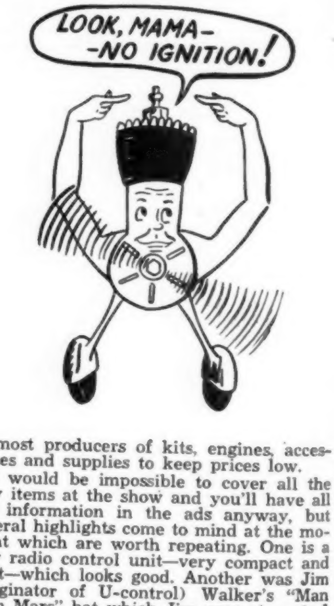


(Continued from page 8)

The belle of the Trade Show ball as far as engines were concerned was the new little 1¾ inch high carbon dioxide (CO_2) powered motor which turns an 8" diameter, 3" pitch prop at a speed of about 7000 rpm. Motor is much smaller than the replaceable "seltzer" cartridge used for motive power and fits nicely into most rubber models.

Diesel engines came in for a big play too. Several were on display; others were announced for early delivery. General feeling now is that they will not supplant ignition jobs but will complement them and interest thousands of sport and "Sunday" flyers. Time will tell.

We got the general impression at the Trade Show that manufacturers are doing their best to produce quality items at lower prices and as far as possible get back to pre-war cost-to-consumer levels. Naturally, with labor and materials higher, that won't be easy if indeed possible at all. But there is an apparent effort or desire on the part



of most producers of kits, engines, accessories and supplies to keep prices low.

It would be impossible to cover all the new items at the show and you'll have all the information in the ads anyway, but several highlights come to mind at the moment which are worth repeating. One is a new radio control unit—very compact and light—which looks good. Another was Jim (originator of U-control) Walker's "Man from Mars" hat which Jim uses at control line demonstrations. It is a football helmet with small radio transmitter on top, antenna mounted on the back, power batteries strapped to ear protectors, and a microphone which swings up in front of his mouth. Jim uses it to describe his maneuvers. Transmission is picked up by receiver placed behind crowd and amplified to sev-

eral speakers . . . really one of those contraptions you must see to appreciate.

Among the many expert model flyers or leaders seen at the show were: Carl Goldberg, Frank Nekimken, Acord and Lidgard, William Good, Russ Nichols, Tom Cunningham, Leon Shulman, Bob Allen (AMA 100), Bob Reder, Milton Huguelet, Red Hillegas, Harry McCall, "King" Maga and a host of others. So many modelers have gone into the business that a meeting of industry folk always produces at least one all-night bull session of ex-contestants at every convention.

AWHILE BACK we mentioned the many new diesels that are coming along. Maybe a word or two on the care and feeding of compression-ignition jobs is in order. When all conditions are right, the diesel should start at first flip. But all the cranking in the world won't get one going if there is something off in the fuel mixture, or the setting (for those with contra pistons) is not correct. The most important feature of diesels is to use the fuel recommended by the manufacturer, and if your engine balks it probably means certain ingredients of the mixture have evaporated. So keep your fuel covered when not filling the tank and keep adding fresh fuel to the tank if the engine isn't inclined to start easily.

By the way, some of these diesel fuels are pretty powerful concoctions. Use them with some care. C. S. Rushbrooke, editor of the English magazine "The Aeromodeller," told us of a chap over there who was running a diesel in a small room on fuel containing a large percentage of ether. The fumes proved too much for him and he passed out . . . for three days! So use such fuels only in a well ventilated spot and follow the precautionary measures specified in all label directions.

Another big deal these days is the practice of using special fuels to run your conventional ignition engine without the ignition system. Here's how it works: you start your engine per usual using a special fuel mixture. The ignition system is external to the model and when the engine is running okay you disconnect the external ignition system and . . . . the engine keeps right on running!

Isn't progress wonderful? This "glow point" method of operation (as the experts describe it) cuts considerable weight from the model and that's particularly important for the smaller control line jobs.

Now that we can run engines without ignition systems, the next step forward will be running them without fuel. Anybody got any ideas on that subject? . . .

ALL THE WAY from Little America comes a message from CPO Stanley Stanwick, one of the really skilled indoor modelers of this country. Stan wasn't down in the Antarctic looking for a new indoor flying site—he was there as a member of the Navy's exploration task force. As he wrote it was the height of summer there (only 20 below). Stan reported that he and his shipmates were to spend a week in New Zealand for rest and recreation before heading back to the States, and he would look up the aero model clubs while there. He didn't mention anything about his original intention to fly a model over the South Pole or as close to it as possible. Among the few possessions each man was permitted for the trip Stan packed away some model building materials. Well, we shall soon know if he was successful and did fly the first model in the vicinity of the South Pole since he is expected to be back here well in advance of the "Nationals."

SOMETHING THAT never seems to have occurred to model contest directors and rulemakers is the idea the general public might get about the long established "open" class. To all modelers that has always meant anybody over 21 years of age. But now, as new sponsors come into the national picture, questions have been raised about this designation. When you talk about junior, senior and open classes, some of these newcomers get the impression that "open class" means anyone can enter that category including junior and senior flyers. Since that is the interpretation in other

(*Turn to page 52*)

WEST COAST TIPS

by JOHNNY DAVIS

FLASH! Latest news of developments on the East-West Match Race front!

Eastern Co-ordinator Tom Herbert made a trip to the West in January to confer on details of the Meet with your reporter. So far, this is the present situation:

Preliminary eliminations will be held starting in May and extending to June 15. In order not to interfere with the All-Western Open, the final Coast elimination meet will be held around the middle of July. The date set for the East-West meet is the end of August in Chicago, and we are hoping to get the use of Soldiers' Field for that purpose.

The West Coast, being rather a large area, has been divided into three territories. In the interests of saving travel time and expense, we have of necessity restricted the three territories as to the number of model builders known. So here are your divisions—please bear with us: *Northern Division:* all of California, Oregon and Washington, north of an imaginary line drawn from the Eastern California State boundary to the Pacific Ocean through a point 10 miles north of Bakersfield, Cal. *Southern Division:* all of California below this imaginary line.

In charge of setting up eliminations in the *Northern Division* will be Roy Mayes, Pres. of Aero-Modelers Assoc. of northern California. In the *Southern Division*, because of the large number of model builders in the areas around Los Angeles and San Diego, a smaller division has been set up so that the San Diego boys will have their own eliminations. Their territory begins with an imaginary line drawn from one mile north of Oceanside and extending straight east to the California border.

After each of these three areas has chosen their 14 representatives, final elimination will be held among these 42 men for the West Coast Team.

The National Exchange Club is sponsoring the event nationally, and will work with model clubs in all towns to help facilitate holding all eliminations of the various communities.

There is no entry fee, men! The only requirement is that your home address be certified by the Exchange Club in your area. This means that if you live in Alhambra, let's say, you will be able to compete only in the eliminations in Alhambra; if you lose out there you can't go and try to get on the team from Long Beach.

When team representatives of the various towns get together for the Division elimination, their only requirement for entry will be certification by their Exchange Club of address and eligibility.

Another point we consider important is in the matter of timers and judges. In the first place, for the eliminations all the way through until we meet in Chicago, there will be no judges or timers, as such. What we want is the consensus of opinion as to who you, as a model builder and not necessarily as a friend, think will best represent your area in the different classes. Here's an example: Say that Burbank is holding their own elimination and Joe X is very popular with the boys and knows everybody in the club. But in the elimination contest, along comes George Z. who is not so well liked, but who does a terrific job of beating Joe X. Now the general opinion may be that Joe X is a swell guy—but what we are after is the top man in the category, so the consensus of opinion should normally go to George Z. Get it? Let's have the top man, regardless of personalities.

We received several snappy letters from the boys back East who did not like the remarks we made about them categorically in a recent column (February "West Coast Tips"). All we have to say to this is that they won't like what we do to their "Experts" *either*, about August 23 and 24!

Unidentified modeler warming up his *Midget* powered Albatross D-3 at '46 Western Open

THERE HAS been some comment on the possibility that the East-West Match race may interfere with the running of the Nationals. We would like to put our oar in on this question right now and say that as far as we are concerned the sponsors of the East-West classic have no intention of running competition for the National meet. If the dates come too close together we will be in favor of changing the date of the East-West race so as to not interfere with the Nats.

The dates mentioned in this column for the East-West match race were planned in January, long before the dates for the Nationals were announced. Now that they appear to be running neck and neck, un-

(*Turn to page* 14)

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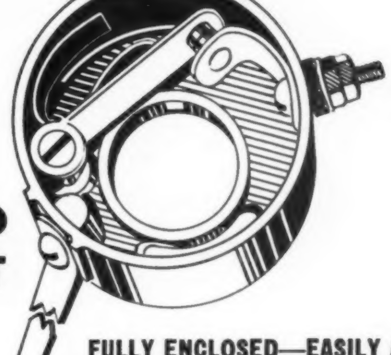

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doubtedly a change will be made to rectify any discrepancy . . . More information on this later.

OTHER "TIP-BITS"—Roy Mayes mentioned the other day that the boys up north were complaining that there weren't enough places available for precision flyers on this match race setup. We agree—but since this event will very likely be an annual one, due to the interest shown, it will probably be next year before details like that can be straightened out. This year we are accepting a Challenge, and the terms of the challenge itself were specifically directed toward West Coast speedsters.

We would like to go on record right now as favoring a resolution that the winner of the Championship (East-West) have the privilege of naming the site for the following year's meet. An arrangement of this sort would most likely be beneficial to the Eastern boys in the sense that travel broadens one's point of view—or is that too subtle?

NOW THAT we have all the partisan pepper out of our system, we are offering a good luck bouquet to a nice guy:

Fred Schrott, of Duramatics fame, is just entering on a writing career as Western reporter for a rival magazine. Once again, MODEL AIRPLANE NEWS has pioneered the journalistic way for model building trends. You will probably see more Western reporters before too long. In the meantime, Fred has always been a big booster for the model craze and we are glad to welcome him into the fold.

WE WERE present at a dinner party given in the nature of a farewell party for popular Bob Hock, genial proprietor of Pasadena Hobby Center. Mr. and Mrs. J. Clement Storey (Keith Storey's folks), gave the party when Bob announced he was returning to Florida to enter his father's business.

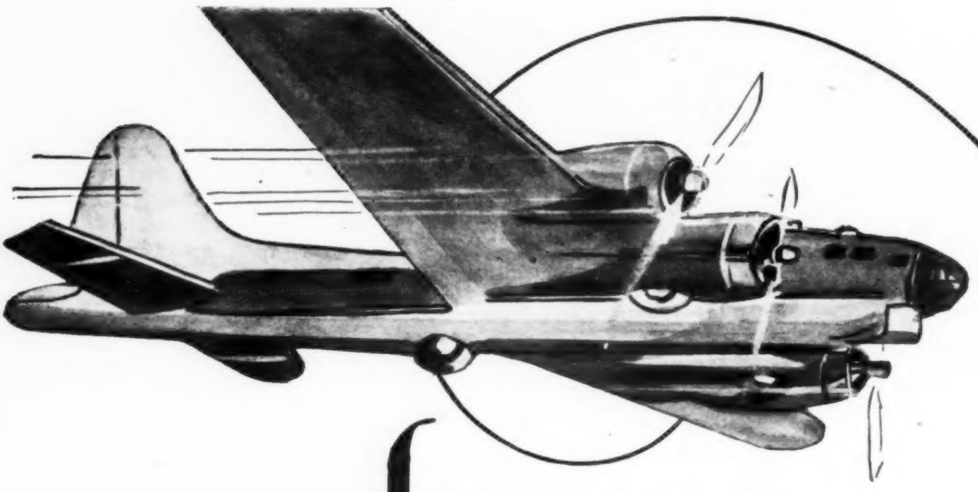
Bob (Lt. Robert Hock, A.A.F.) was well liked in Southern California model circles. He was also beginning to give some of the speed boys real competition in the Class III category. We will miss him. Incidentally, we won't be surprised to see some of the Florida boys get real fast after Bob has been there awhile.

WE LEARNED the other day of a new type of club. Its name is the *First All Speed Team*. This is rather an odd name until you take the first letter of each word: then you have F-A-S-T, which is the way the boys intend to go.

So far the speed team is composed of only 8 men: Les MacBrayer, Jim Baker, Norman Morgan, Keith Conrad, Leighton Conrad, Keith Storey, Ed Miller and Bill Carver. However, they are definitely modelers with whom to reckon. This group entered 15 contests in Southern California and National competition in 1946 and managed to win 55 trophies. That ain't hay, Jackson!

Their membership is not limited but is open to any and all modelers interested in speed flying. Their requirements are simply that an applicant be interested in flying fast and flying in competition. Also they are not electing any officers—this is going to be different, they say. The big idea behind having the club at all is to exchange ideas and theories and to try them out together in practice . . . Look for some records to be broken by this gang!

"If this is the best this thing'll do . . . I'll walk!"



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ATLANTA 1, GEORGIA

NATIONALS SCALE WINNER

by HENRY STRUCK

Besides being a contest winner this Stinson L 5 is a fine flier

PREMIER liaison aircraft of the Army Air Forces during World War II, the Stinson L 5 promises to assume a similar position in the flying scale model field. A high wing design, with tip slots and generous dihedral, large tail surfaces and long moment arm, high power and light weight, the L 5 displayed an astonishingly steep climb and low stalling speed with excellent control. Identical design features are considered essential by most modelers for a good endurance flier—so generally in fact that five individual versions of the L 5 were entered in the National Meet.

Scaled from authentic technical data, our L 5 received a good score for accuracy, detail and finish. After several comic clashes with regulations and weather, the ship was ready to be flown. A conservatively wound early morning flight under excellent conditions turned in a duration of 1'30". Then the wind sprang up and blew with traditional force across the open prairie, as it had done every day—except of course the day before the contest. Any chance of achieving the satisfaction of a long thermal flight with a scale model was thus lost. But at least the ship was able to prove its stability and consistency as equal to the "contest" jobs flying.

Here we pause to collect a few old boards and bent nails, knock together an unsteady soap box, climb up on it and turn agitator . . .

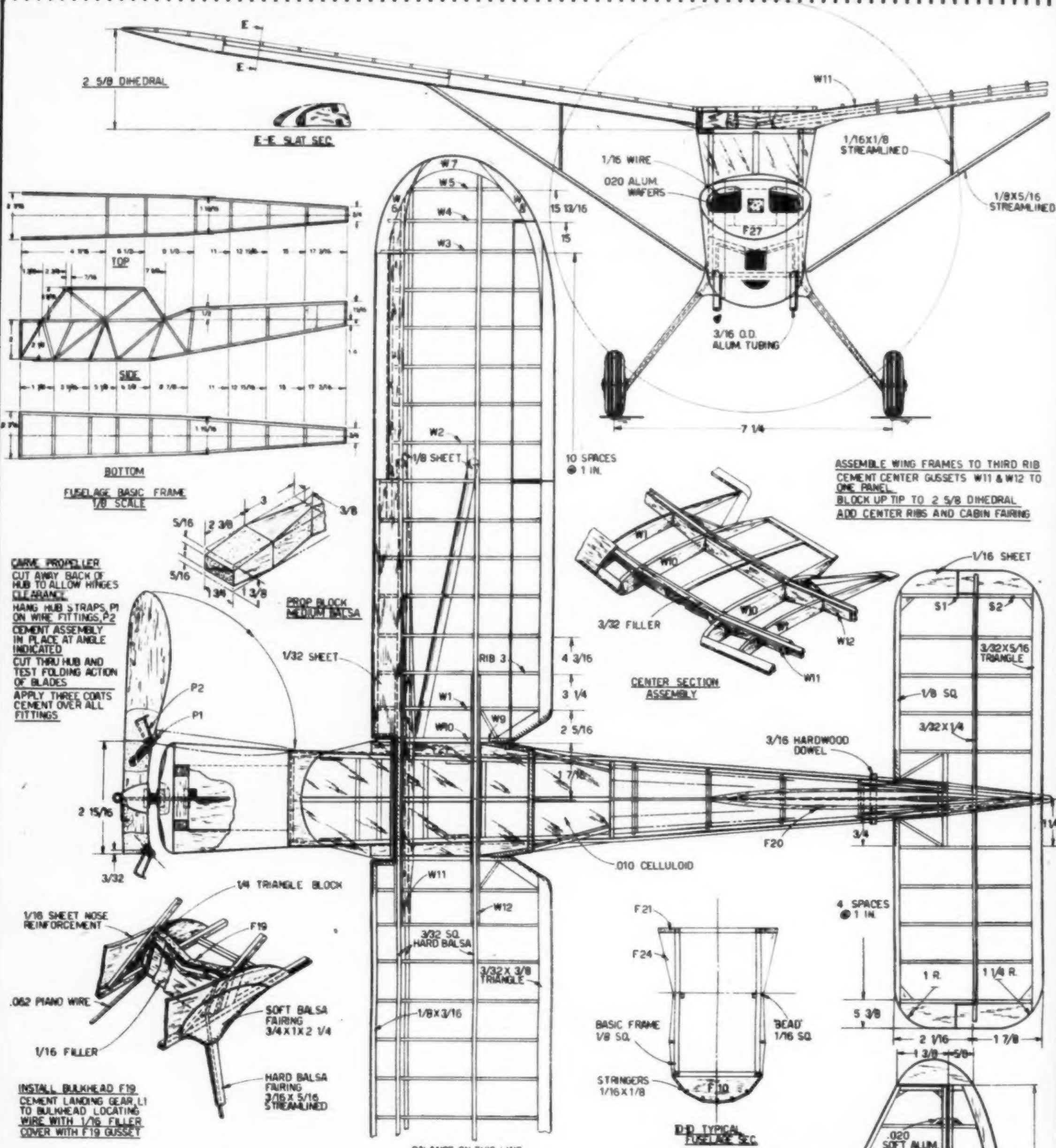
There are some who think a flying scale model should whirl on a string, or stagger through the air for a certain minimum time in order to protect a beautiful piece of craftsmanship. No one, of course, wishes to see such a work of art destroyed. But then it ought to be kept at home to be admired and the flying left to the "birds" that can take care of themselves. The very sensitivity to adjustments of a flying scale model teaches one the effect and value of each minute alteration, also the characteristics of various aerodynamic arrangements. Rather than getting into a design rut, an interested modeler can go on from there equipped with sounder experience to aid him in developments of his own.

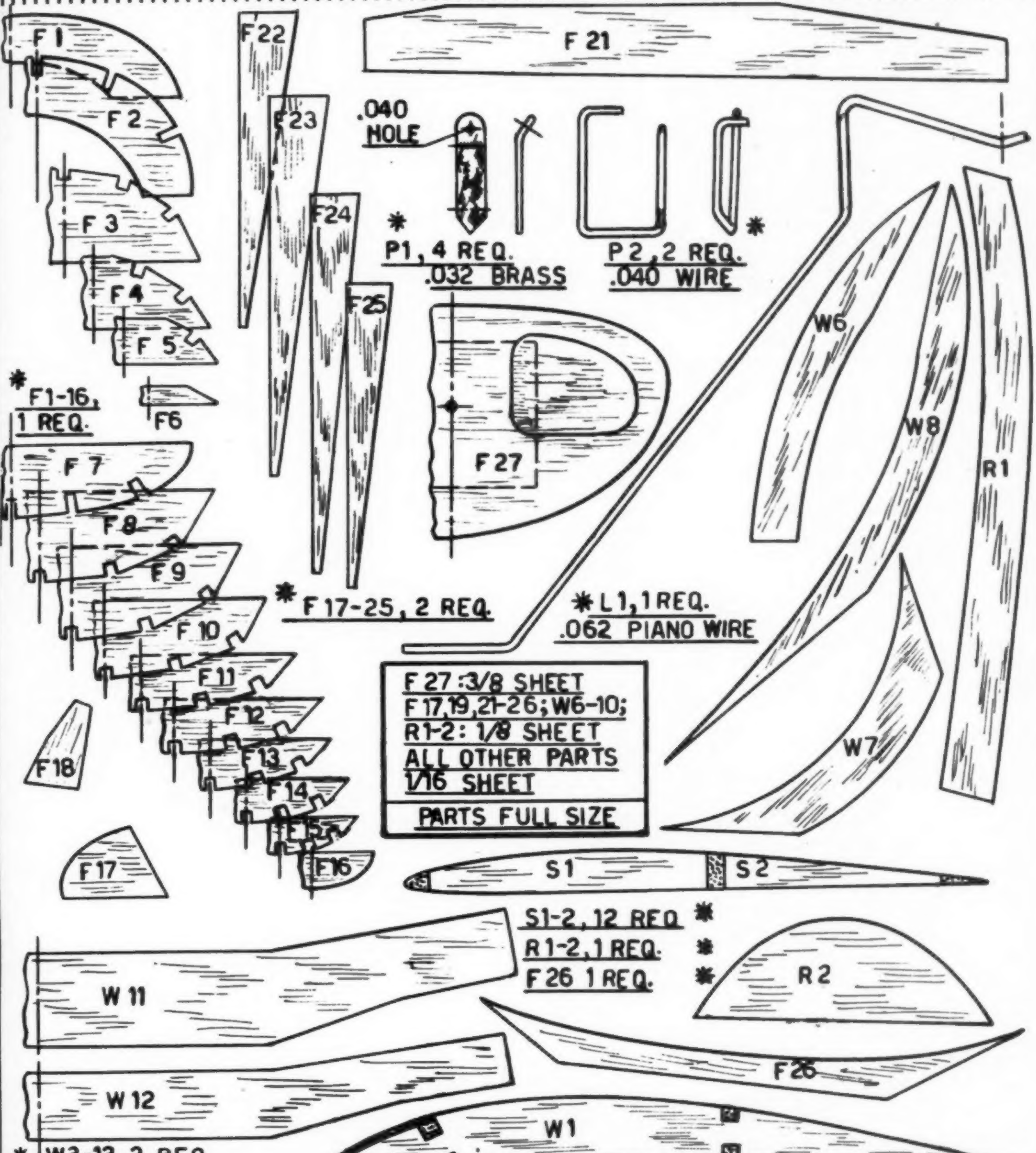
More free flight flying scale events, gas or rubber powered—with less emphasis on paint and feathers to reduce time wasted in "judging"—will give ships of this type an opportunity to show what they can do in the air. Probably a set of templates against which the form (or configuration as the engineers call it) could be checked would provide ample inspection. This we believe would make for more interesting modeling.

CRASH! Well we were up on that soapbox too long anyway!

BUILDING THE L 5—the general assembly view is drawn one-quarter size. It will be necessary to enlarge only the fuselage basic frame side view, and the wing, stabilizer and fin plan outlines to full scale. Information for this can be found on the assembly drawing and supplemented with the

(*Please turn to page 74*)


2 5/8 DIHEDRAL
E-E SLAT SEC
W11
1/16 WIRE
020 ALUM. WAFERS
1/16X1/8 STREAMLINED
1/8X5/16 STREAMLINED
F27
3/16 O.D. ALUM. TUBING
7 1/4
TOP
SIDE
BOTTOM
FUSELAGE BASIC FRAME 1/8 SCALE
10 SPACES @ 1 IN.
1/8 SHEET
ASSEMBLE WING FRAMES TO THIRD RIB
CEMENT CENTER GUSSETS W11 & W12 TO ONE PANEL
BLOCK UP TIP TO 2 5/8 DIHEDRAL
ADD CENTER RIBS AND CABIN FAIRING
PROP BLOCK MEDIUM BALSA
CARVE PROPELLER
CUT AWAY BACK OF HUB TO ALLOW HINGES CLEARANCE
HANG HUB STRAPS, P1 ON WIRE FITTINGS, P2
CEMENT ASSEMBLY IN PLACE AT ANGLE INDICATED
CUT THRU HUB AND TEST FOLDING ACTION OF BLADES
APPLY THREE COATS CEMENT OVER ALL FITTINGS
3/32 FILLER
CENTER SECTION ASSEMBLY
1/16 SHEET
3/32X5/16 TRIANGLE
1/8 SQ.
3/32X1/4
1/32 SHEET
RIB 3
3/16 HARDWOOD DOWEL
2 15/16
3/32
.010 CELLULOID
F20
1/4 TRIANGLE BLOCK
1/16 SHEET NOSE REINFORCEMENT
.062 PIANO WIRE
SOFT BALSA FAIRING 3/4X1X2 1/4
1/16 FILLER
HARD BALSA FAIRING 3/16X5/16 STREAMLINED
INSTALL BULKHEAD F19
CEMENT LANDING GEAR L1 TO BULKHEAD LOCATING WIRE WITH 1/16 FILLER
COVER WITH F19 GUSSET
3/32 SQ. HARD BALSA
3/32X3/8 TRIANGLE
1/8X3/16
4 SPACES @ 1 IN.
BASIC FRAME 1/8 SQ.
'BEAD' 1/16 SQ.
STRINGERS 1/16X1/8
D-D TYPICAL FUSELAGE SEC
1 R.
1 1/4 R.
5 3/8
BALANCE ON THIS LINE
.020 SOFT ALUM.
INCIDENCE AT ROOT 3° (5/16)
C-C TYPICAL FIN SEC.
4 SPACES @ 1 IN.
1" BEARING WITH STOP 2 WITHOUT STOP
STOP
.020 WIRE SPRING 1/4 O.D. WASHER EACH SIDE
.062 PIANO WIRE
.010 WIRE HOOK
1/16 SHEET
1/32 SHEET FAIRING
3/8X7/8X3 SOFT HOLLOWED(1/16)
NEG. INCIDENCE 1 1/2°
1/16 ROUND
STRUT FREE TO MOVE
.016 PIANO WIRE
NOSE BLOCKS
TOP 1/2X1 5/8X3
SIDE 5/8X3X3 1/2
BOTT. 1X1 5/8X4
SOFT BALSA
A-A OIL COOLER
B-B CARBURETOR AIR SCOOP
1/2X1 3/4 WHEELS (BALSA OR AIRWHEELS)
FLIGHT NOTES
STINSON L-5
POWER 10 STRANDS 1/4 FLAT (OR EQUIV.) X 24
ADJUSTMENTS 3/64 RIGHT RUDDER
WASHOUT LEFT WING 1/8 AT RIB 13
DOWNTHRUST 1° RIGHT THRUST 3°
POWER & GLIDE FLIGHT RIGHT CIRCLES
WINNER 1946 NATIONALS FLYING SCALE
FINISH ENTIRE SHIP OLIVE DRAB
BOTTOM SURFACES GREY
AREA 145 SQ.IN.
WEIGHT 4 1/2 OZ.
1/4 SCALE & NOTED


F1
F2
F3
F4
F5
F6
*F1-16, 1 REQ.
F7
F8
F9
F10
F11
F12
F13
F14
F15
F16
F17
F18
F22
F23
F24
F25
*F17-25, 2 REQ.
F21
.040 HOLE
* P1, 4 REQ. .032 BRASS
P2, 2 REQ. .040 WIRE *
F27
*L1, 1 REQ. .062 PIANO WIRE
W6
W8
R1
W7
F 27: 3/8 SHEET
F 17,19,21-26; W6-10;
R1-2: 1/8 SHEET
ALL OTHER PARTS
1/16 SHEET
PARTS FULL SIZE
S1
S2
S1-2, 12 REQ *
R1-2, 1 REQ. *
F26 1 REQ. *
R2
W 11
W 12
F26
*W3-13, 2 REQ.
W1
* W1, 14 REQ.
W 2
* W2, 10 REQ.
W3
F 19
W 13
W4
W 10
W9
W5
F 20

DESIGN FORUM

by **CHARLES H. GRANT**

CONTROLLING flight of model planes seems to be the greatest problem of model fliers. A great deal has been written concerning the advanced theory of control but apparently many builders are unfamiliar with the simple elements entering some of these problems.

Model builders do not wish to stick to the one type of plane with which they are familiar; they want to build and fly many types. To make the different types fly properly, however, one must know how to arrange the aerodynamic forces so that the model will be stable during both power-on and gliding flight, to say nothing of insurance against spiral dives, loops and other disconcerting maneuvers. Actually, the arrangement of these forces is not difficult. First, you must know these forces—they are:

1. Lift (L)
2. Total airplane weight (W)
3. Total airplane drag (R)
4. Propeller thrust (T)
5. Stabilizer force (S)
6. Side Pressure.

All these forces act at certain points in the airplane. Some are fixed; others change their reaction point and their intensity with changes in angles of flight relative to the lateral, vertical and longitudinal axis. The fixed forces on all normal airplanes are thrust (T) and weight (W). Both of these act at the same point during all phases of flight. (W) remains constant in intensity; thrust however changes in intensity. It increases as the speed of the airplane decreases; so we see that thrust increases with steepness of climb because the steeper the climb the slower the plane will fly. Of course if the engine speed changes then the thrust will change also, but here we assume that engine speed is constant.

The force (S) acting on the stabilizer, Fig. 1, acts at relatively the same point during all phases of flight. It moves forward and backward slightly with a change in angle of attack, this movement being dependent upon the crossection of the stabilizer. The movement is so small, however, that it has no decisive effect on the airplane's flight. Forces (L) and (R) also change their point of reaction, but their movement has considerable effect and are therefore important.

Those who understand what these forces are and how they move can design their airplane so the forces will be arranged in a way that their movement will create corrective moments instead of disturbing moments. Believe it or not, the basic arrangement of the forces in most model airplanes flying today is such that they are unstable. All sorts of palliatives and tricks must be used to overcome the disturbing effect of their improper arrangement. Fig. 1 shows the basic and correct arrangement for maximum sta-

(*Turn to page* 55)

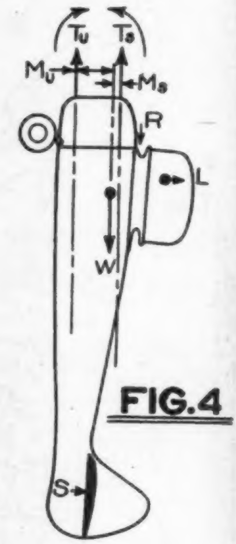


FIG.4

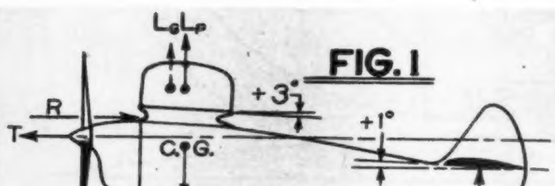


FIG. 1

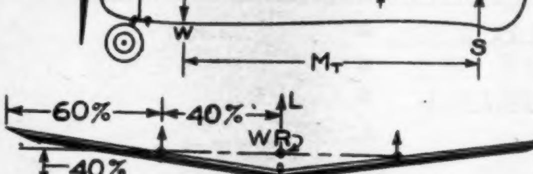


FIG. 2

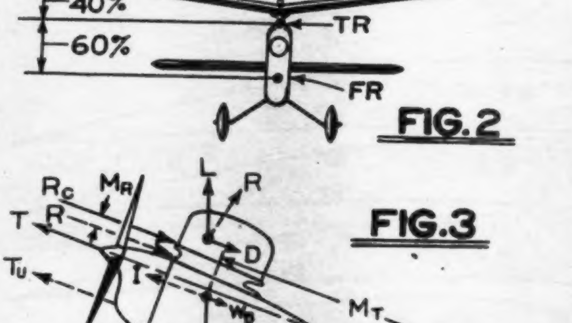


FIG.3

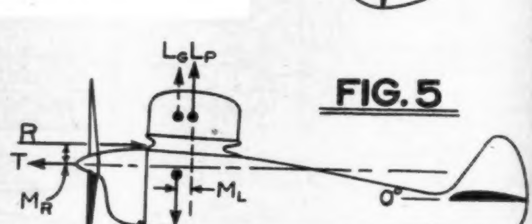


FIG. 5

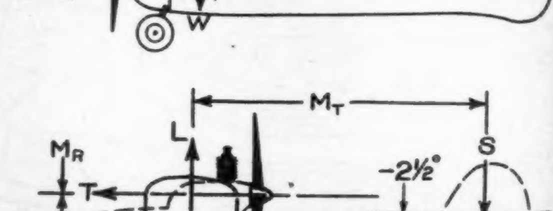


FIG.6

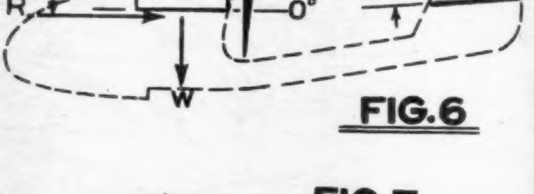


FIG.7

WIND THAT RUBBER

by W. F. TYLER

Rubber tester of J. P. Glass determines energy of strip

Rubber flying is not dead by a long shot—beginners will learn some of the tricks from this article

BACK in the days when rubber was king and gas models unheard of, it used to be said that the chief asset for winning a contest was a strong arm and a weak mind. Of course the character who started that legend was exaggerating slightly, yet we've known many a good model builder who never took home any hardware only because he didn't know how to pack in those thermal catching turns.

On the other hand, there's the sad case of Willet Fly, a real madman with the winder. Willet, a very rash chap, had that strong arm winding technique down cold, but unfortunately in the excitement of a contest he always forgot when to stop packing in turns. Result: Willet always carried home not the hardware but the pieces of his shattered crates. The moral of this story is to point out that a certain amount of skill is required along with brawny biceps.

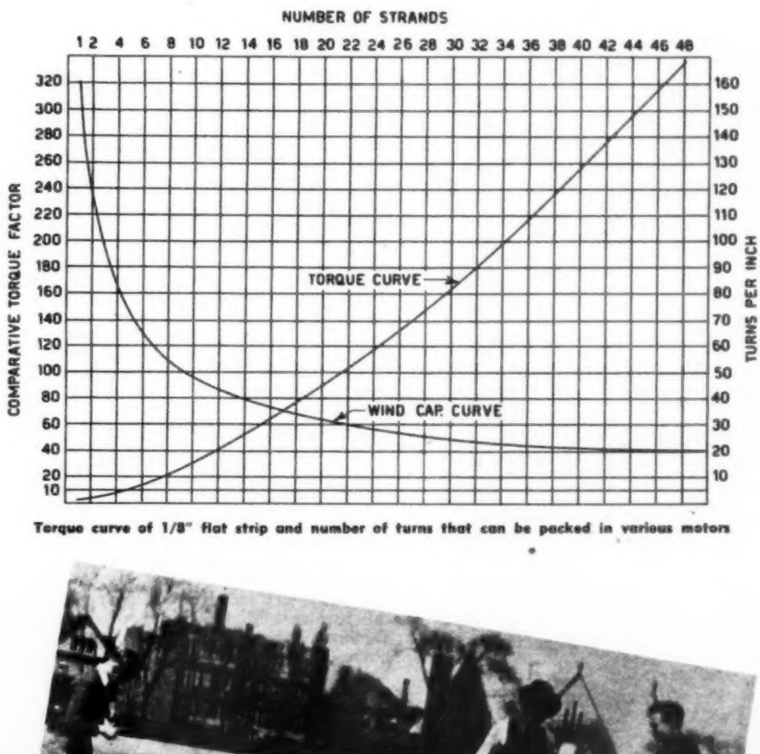
Wait a second, chum, and read on further before you write the editor of M.A.N. and tell him what an old fogey you think he is for printing an article on rubber when all you ever build are gas models. There's a good reason for talking about rubber at the present time. Have you heard that this year, for the first time, State elimination meets will be run off to determine who will make up the State teams that will be allowed to compete in the Nationals? Furthermore, most States will hold rubber powered elimination meets (both indoor and outdoor flying) as well as gas events. State teams will be picked from winners of all events. So if you want to go to the Nationals next year and don't place high enough in the gas events to qualify for your State team, start building and practicing rubber flying now so that you can win in the rubber event and assure your place on the team.

Contest winning rubber powered models, both outdoor and indoor types, depend largely on how many turns can be wound in the motors for maximum duration. Indoors, it's a case of having a light enough model so that when the rubber is fully wound the slow turning rpm of the prop gives the model more flight duration than the other fellow's model. With outdoor models, two schools of thought exist: The English builders, along with those in the other European countries, believe in long motor runs. Their designs are apt to be beautifully streamlined (Bob Copeland's *British Champ* as an example) and use long, low-powered motor runs combined with a high pitch, slow turning prop. Some English models will fly on power alone for over 5 mins. before starting to glide. Americans as well as Canadians favor less streamlined jobs (Korda's Wakefield Winner as an example), tending more to simple boxlike construction, but they believe in super power for a rocketlike climb so as to get the model high enough to hit a thermal.

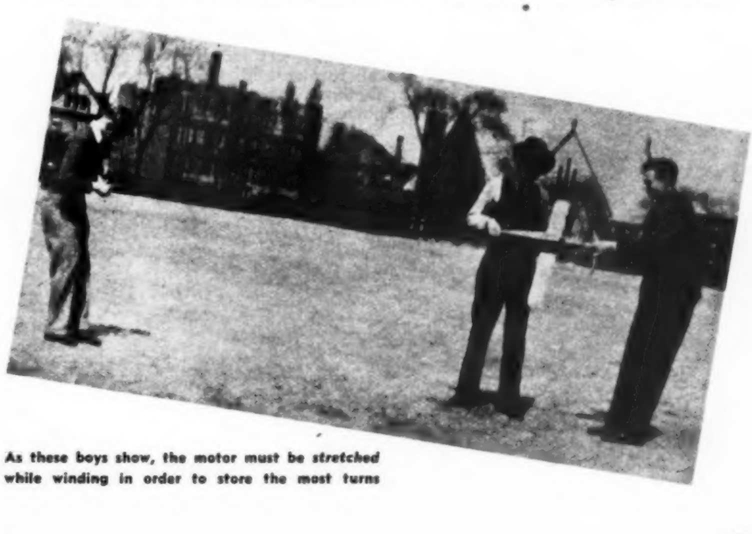
These models have extremely short but super powerful motor runs that give a rubber job a climb like a *Zipper* gas model. Streamlining for gliding purposes is usually disregarded as most American builders believe that if a paper bag will soar in a thermal, so will most any model, the important idea being to get the model high enough to hit a thermal. Probably the best explanation for these two different theories is that in England, due to weather conditions, thermals are not as prevalent as over here; hence more contests are won on the flying ability of the model itself.

Another way of looking at this problem is from the wing loading viewpoint. Take a Wakefield model for example: the rules

(*Turn to page* 66)

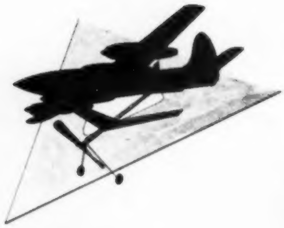


Torque curve of 1/8" flat strip and number of turns that can be packed in various motors

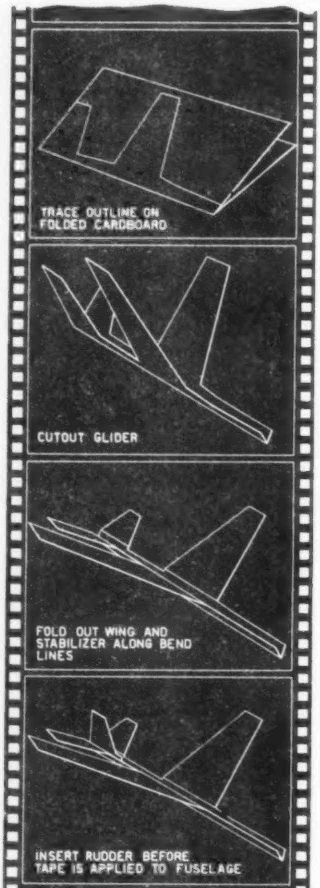


As these boys show, the motor must be stretched while winding in order to store the most turns

MODEL AIRPLANE COURSE FOR BEGINNERS



A CAREFULLY PLANNED AND TESTED SERIES OF ARTICLES FOR BEGINNERS IN THE ART OF BUILDING AND FLYING MODEL PLANES



This new department is strictly for *beginners* . . . for the many thousands, of all ages, who want to learn how to build and fly model airplanes of all types. In a series of illustrated articles, and a Question-Answer column, the staff of this magazine will guide you step by step through the various stages of model building—starting from scratch.

The first thing you should do is to seek out others—in your neighborhood, school, church or boys' club—who are building model airplanes. It is estimated there are 3,000,000 of these enthusiasts throughout the country, and many of them are banded together into clubs and hold regular meetings and competitions. Join such a group if at all possible.

In addition to these groups, your neighborhood hobbycraft shop can offer helpful service during your modelling career.

ALL models, simple and advanced types, are made up of the same component parts, namely: *wings* for lift; a *stabilizer* for longitudinal stability; and a *rudder* for directional stability — SEE FIG. 1. All of these units are fixed to a stick or *fuselage*.

To move a model through the air, a propulsive force or *thrust* is needed. In some models, this is accomplished by a propeller rotated by a motor. In others, such as *gliders*, the thrust is furnished by means of catapulting or *throwing* the model forward. It is with the latter type of model, a GLIDER, that we shall first experiment.

CONSTRUCTING THE BEGINNER'S GLIDER

Tools and Materials. Only a few simple tools are needed. With the aid of a pencil, ruler, scissors, cardboard and Scotch tape we are "in business," our object being to construct the tiny cardboard glider illustrated in FIG. 2.

A stationery store or art supply dealer can furnish both the Scotch tape and the cardboard. The tape should be of thin cellophane, but if this type is not available heavier masking tape can be substituted. In the selection of cardboard we must be more exacting because a lightweight yet fairly rigid board is required. If purchased in an artist's supply house, ask for a piece of two-ply smooth finish Bristol board; in a stationery store, get a standard cardboard letter folder.

Look at FIG. 3. Note that a full size pattern of the model is furnished, the outline of which includes: the *fuselage*, *wing*, and *stabilizer*. Also in this view is the outline of the *rudder*, which is indicated in broken lines because it is cut separate from the glider pattern.

Fold the cardboard as indicated in the top frame of the "film strip" on this page and trace the pattern as shown. Holding the folded cardboard firmly between your fingers, cut out the glider as indicated in the second frame of the strip. Note that both sides of the model are cut simultaneously; when doing this you will find it simpler to use a razor for the final cut along the fuselage top between the wing and stabilizer.

After the glider proper has been separated from the cardboard, fold out the wings and stabilizer as shown in the third frame of the film strip. This is done by placing the sharp edge of a ruler along the bend lines at the base end of the wing and stabilizer, and folding the surface over the ruler. In this way you will get a clean sharp fold.

Next, trace and cut out the rudder from the same material used for the glider proper. When this is done, insert the rudder in the "V" of the glider fuselage as shown in the bottom frame.

Using Scotch tape, bring the top edges of the fuselage together and seal. Place strips of Scotch tape as shown in FIG. 2. Again referring to the same figure, make sure the wings and stabilizer are bent upward as indicated. Because our model is fashioned of material that is not too rigid, these dimensions need only be approximate.

We are now ready to undertake the most important step: to balance the glider so as to insure good flying performance.

In FIG. 3, the balance point or *center of gravity* is indicated as being just aft of the

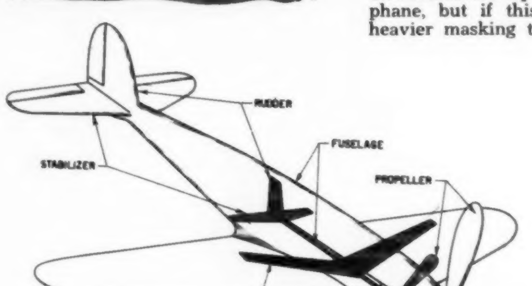


FIG. 1

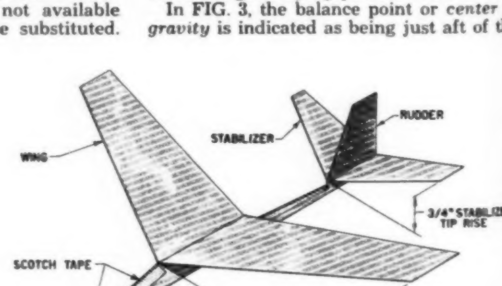


FIG. 2

mid-point along the bend line at the base of the wing. To bring the balance point to the right spot, wrap Scotch tape around the nose of the glider. Continue adding tape until the model balances as indicated.

After this has been done the model is ready for its first trial glide. Hold the glider between your thumb and index finger just behind the balance point; then gently throw it forward, making absolutely certain that the nose is pointed slightly downward and that the wingtips are level when the model is released. This should result in a moderately long gentle glide. Repeat this several times, making certain before each trial that the tip rise, called *dihedral*, of both the wings and stabilizer has not been changed from the original position in FIG. 2, and that all surfaces are free from warpage.

After this testing has been repeated sufficiently to give confidence to your launching technique, you are ready to try "maneuvers" by adjusting the tail surfaces. This adjustment consists mainly of bending the rudder surface slightly to cause the model to circle to the right or left; or bending the stabilizer to cause the model to nose up or down.

As our glider is constructed of non-rigid material extreme care must be exercised in these experiments, because only very slight bending of the surfaces is needed to change the model's flight path.

You will note that if the rear edge of the stabilizer is bent down, the nose of our glider points down immediately after launching and the model dives. If the stabilizer is bent up, the opposite happens.

Also note that by bending the aft end of the rudder to the right or left, we can produce right or left turns. Thus we find that by changing the alignment of the tail surfaces from normal (or neutral) position, the balance of the model can be upset. In addition to using this means to change the model's flight path, it is often used to insure proper flight should the model not be completely balanced at the start.

Good flights can be achieved with our little glider, however, by simply maintaining proper balance, and little if any adjustment should be necessary.

Experience gained in flying this glider will help us when we tackle a *high performance balsa glider*, which is to be our second project in the next issue.

* * *

And now, before closing our first session in the art of model building, let's start our QUESTIONS-ANSWERS column with the following pertinent ones:

QUESTION: What is the meaning of the terms "longitudinal," "lateral" and "directional" stability?

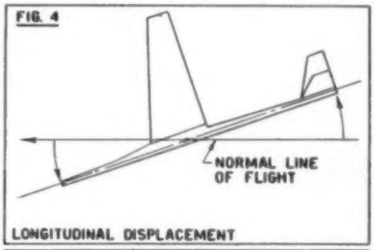
Answer: A model in flight can rotate in three directions: (1) along a fore and aft axis nosing up or down longitudinally as indicated in Fig. 4; (2) directionally to the right or left as in Fig. 5; (3) or laterally through its point of balance as in Fig. 6. Longitudinal, lateral, or directional stability is that quality in the design which causes the model to return to normal line of flight after it has been upset or disturbed.

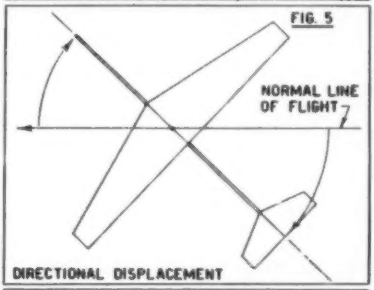
QUESTION: How can I find if there is a model building club in my locality?

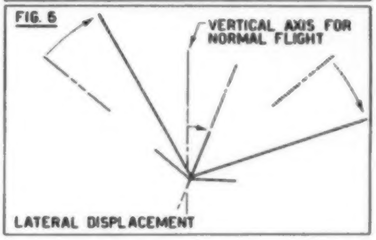
Answer: Inquire at your local school, church, boys' club or hobby shop—if you have no luck there, write to: Academy of Model Aeronautics, 1025 Connecticut Ave. N.W., Washington 6, D.C., for a list of the model airplane clubs in your area.

QUESTION: What is a good reference book on this subject?

Answer: Here are three you can choose from: "Design for Flight" by C. H. Grant; "Model Airplane Design & Theory of Flight" also by C. H. Grant; "The Model Aircraft Handbook" by W. Winter. You can get these in most hobby shops; otherwise the first two can be obtained from Air Age Inc., 551 5th Ave., New York 17; and the third book from T. Y. Crowell, 432 4th Ave., N.Y.C.







DID YOU KNOW

- ...THAT "control line" models have reached officially timed speeds of 135 miles per hour.
- ...THAT "indoor" models weighing one-tenth of an ounce have flown for almost 30 minutes.
- ...THAT the distance covered by the Wright Brothers flight at Kitty Hawk, N.C., in 1903 was 284 yards.
- ...THAT in 1867 Otto Lilienthal built a pedal-driven ornithopter that was rigged to a pulley and counterweight by which he was able to measure lift.
- ...THAT in 1877 Enrico Forlanini, an Italian engineer, successfully flew a steam-powered model airplane for a duration of 20 seconds.
- ...THAT in 1887 Gustav Trouve produced a successful electric-powered airplane model.

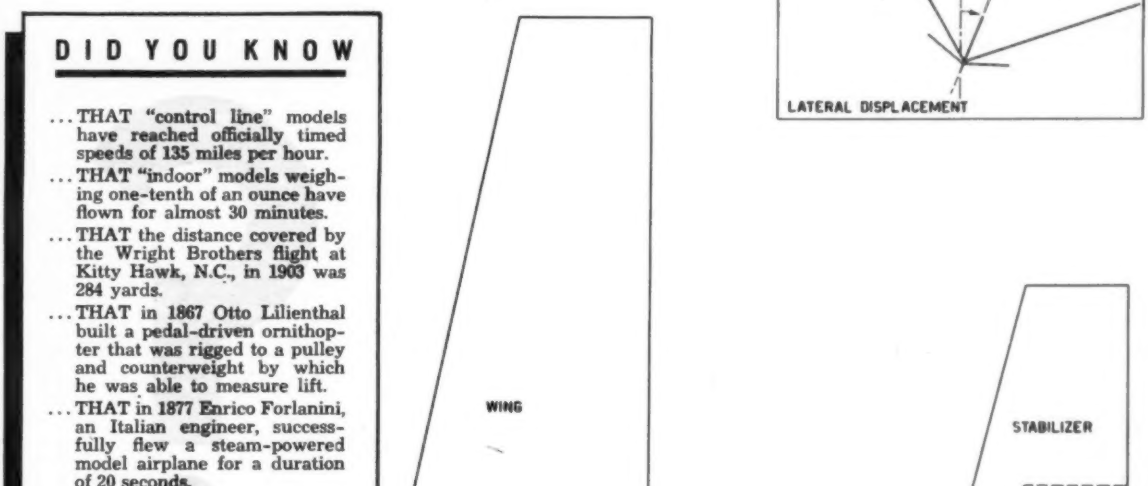
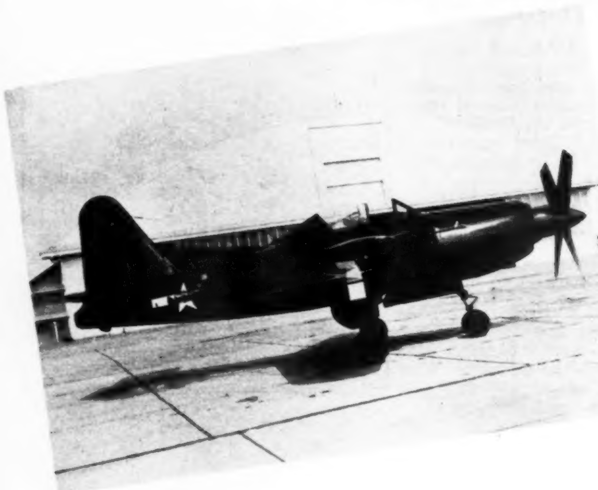


FIG. 3
FULL SIZE GLIDER PATTERN

PLANE ON THE COVER

RYAN XF2R-1



IN this age of atomic bombs, guided missiles and rocket warfare, the U. S. Navy is wisely planning in terms of today's aircraft carrier as a basic unit in a naval fleet. Whether the carrier is to be outmoded as a fleet unit, or the fleet itself to become obsolete as a war weapon, are only philosophic questions.

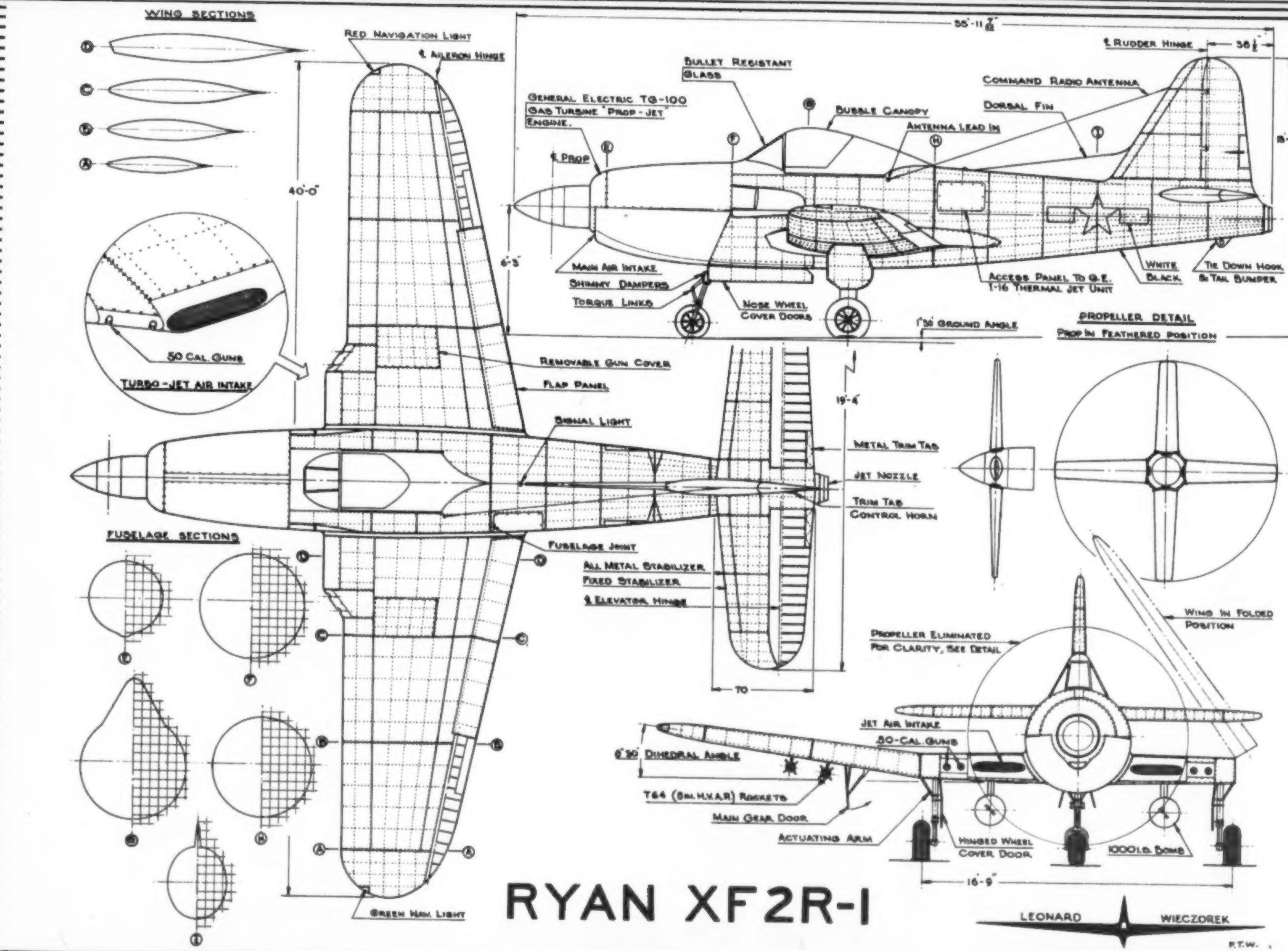
The over-riding consideration is: "What weapons do we have today to fight a battle today?" That is the basic premise of sound national defense. A second premise is that we must incorporate into our defense every new scientific advance and technical engineering achievement as quickly as possible, commensurate with its smooth integration into the existing structure.

Adapting jet propulsion to the carrier plane has not proved a simple task. When jet propulsion was first announced to the public on January 7, 1944 it was immediately hailed as a miraculous new attainment of science and the layman stood convinced that it could do anything. The ensuing three years have proved, again, that the time element between invention and practicability is a long painstaking one, and although great strides have been made in gas turbine progress a tremendous amount of work remains to be done.

The first heartbreaking task was to examine and clearly recognize the limitations, if any, of this new found source of aircraft propulsion power. The first and still one of the most notorious disadvantages of jet power is its dependence on aircraft speed. The turbojet engine develops its maximum thrust when the airplane stands still on the ground. The instant the plane begins to roll forward, that thrust output starts to drop and continues to fall as the airplane increases speed. This disappointing state of affairs continues until the airplane reaches a speed of 375 miles per hour (about 1/2 the speed of sound). Fortunately, at this point the thrust begins to increase and climbs steadily upward until the full rated thrust is again developed at about 750 mph (the speed of sound).

Another method of stating this fundamental consideration is to examine the ratio of jet speed to aircraft speed, which is a definition of the propulsive efficiency. Propulsive efficiency of the system is 100% when jet speed and aircraft speed are the same. Since the jet speed exhausts from the tail pipe at just under the speed of sound, the airplane will achieve maximum propulsive efficiency at a speed of about 650 mph at 35,000 ft., and about 750 mph at sea level. At 1/2 the speed of sound the propulsive efficiency drops to about 66-2/3%, and at 1/3 the speed of sound this efficiency is

(*Turn to page* 44)


WING SECTIONS
RED NAVIGATION LIGHT
℄ AILERON HINGE
40'-0"
35'-11 7/8"
BULLET RESISTANT GLASS
GENERAL ELECTRIC TG-100 GAS TURBINE "PROP-JET" ENGINE.
℄ PROP
BUBBLE CANOPY
ANTENNA LEAD IN
COMMAND RADIO ANTENNA
DORSAL FIN
℄ RUDDER HINGE
38 1/2"
8'-4 1/2"
6'-3"
MAIN AIR INTAKE
SHIMMY DAMPERS
TORQUE LINKS
NOSE WHEEL COVER DOORS
ACCESS PANEL TO G.E. I-16 THERMAL JET UNIT
WHITE
BLACK
TIE DOWN HOOK & TAIL BUMPER
1°30' GROUND ANGLE
PROPELLER DETAIL
PROP IN FEATHERED POSITION
50 CAL GUNS
TURBO-JET AIR INTAKE
REMOVABLE GUN COVER
FLAP PANEL
SIGNAL LIGHT
19'-4"
METAL TRIM TAB
JET NOZZLE
TRIM TAB CONTROL HORN
FUSELAGE SECTIONS
FUSELAGE JOINT
ALL METAL STABILIZER
FIXED STABILIZER
℄ ELEVATOR HINGE
70
WING IN FOLDED POSITION
PROPELLER ELIMINATED FOR CLARITY, SEE DETAIL
JET AIR INTAKE
50-CAL. GUNS
6°30' DIHEDRAL ANGLE
T64 (5in. H.V.A.R.) ROCKETS
MAIN GEAR DOOR
ACTUATING ARM
HINGED WHEEL COVER DOOR
1000 LB. BOMB
16'-9"
GREEN NAV. LIGHT
RYAN XF2R-1
LEONARD
WIECZOREK
P.T.W.

Rugged float attachment makes water flying easy

Skipjack is fitted here with wheels and Arden engine for use on land

SKIPJACK

by FRANK EHLING

As a landplane again—this time with *Mite* diesel

Note the tail high position—essential for good water performance

THIS model in the air with floats looks for all the world like the light seaplanes that fly about on a Sunday afternoon at the local seaplane base. No, this ship isn't that hot contest job that takes off like a frightened rabbit; it takes off as if there was a pilot at the controls, and when the engine cuts the ship goes into a nice glide without a dip, truly making a smooth flight.

The ship can be flown with the *Mite* diesel and with the Arden .099 converted to use the diesel head; these engines will be excellent for free flight. The U-Control fans will find the Arden .199 packs plenty of power for their needs. The ship can be flown U-Control from the edge of a pool, as in this manner the pilot has better footing and if the engine cuts out over the land he can swing the ship around until it is again over the water, then bring the ship in nose high.

If the model is to take off and alight with ease, the angle at which this is accomplished must be determined with the rear strut. If the float angle is too small the takeoff may be long or even impossible, and if too great the ship will fly too slowly due to the drag set up by the floats, so the rear strut will be the main consideration in adjusting the takeoff.

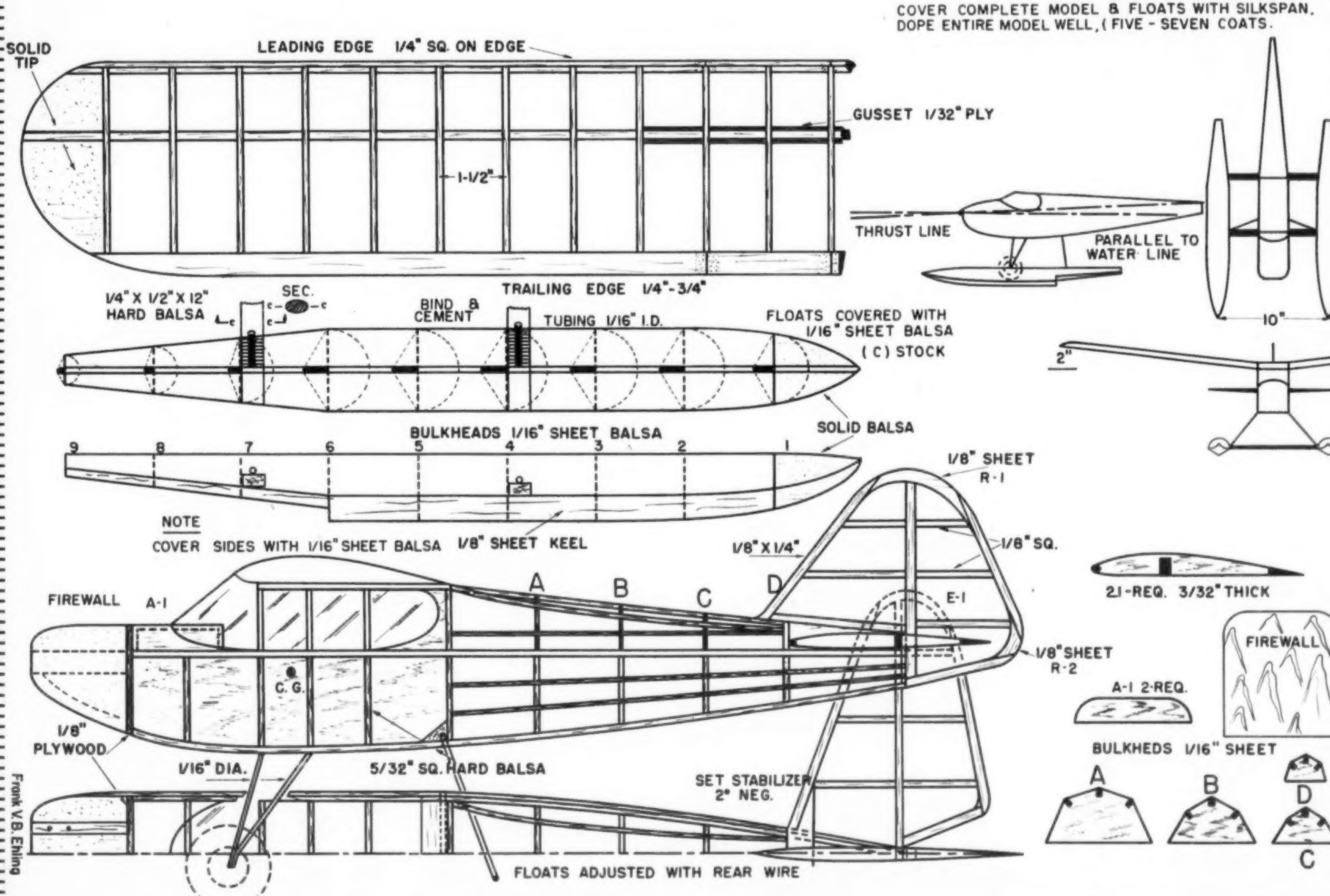
The model is a fine stable flier with or without the floats, so if there are no small ponds near you the ship is still a honey with a set of air wheels; however, if it rains hard and you can find a small puddle, slip on the floats because this airplane will take off in a small space, and landing on the good old earth will not hurt the floats.

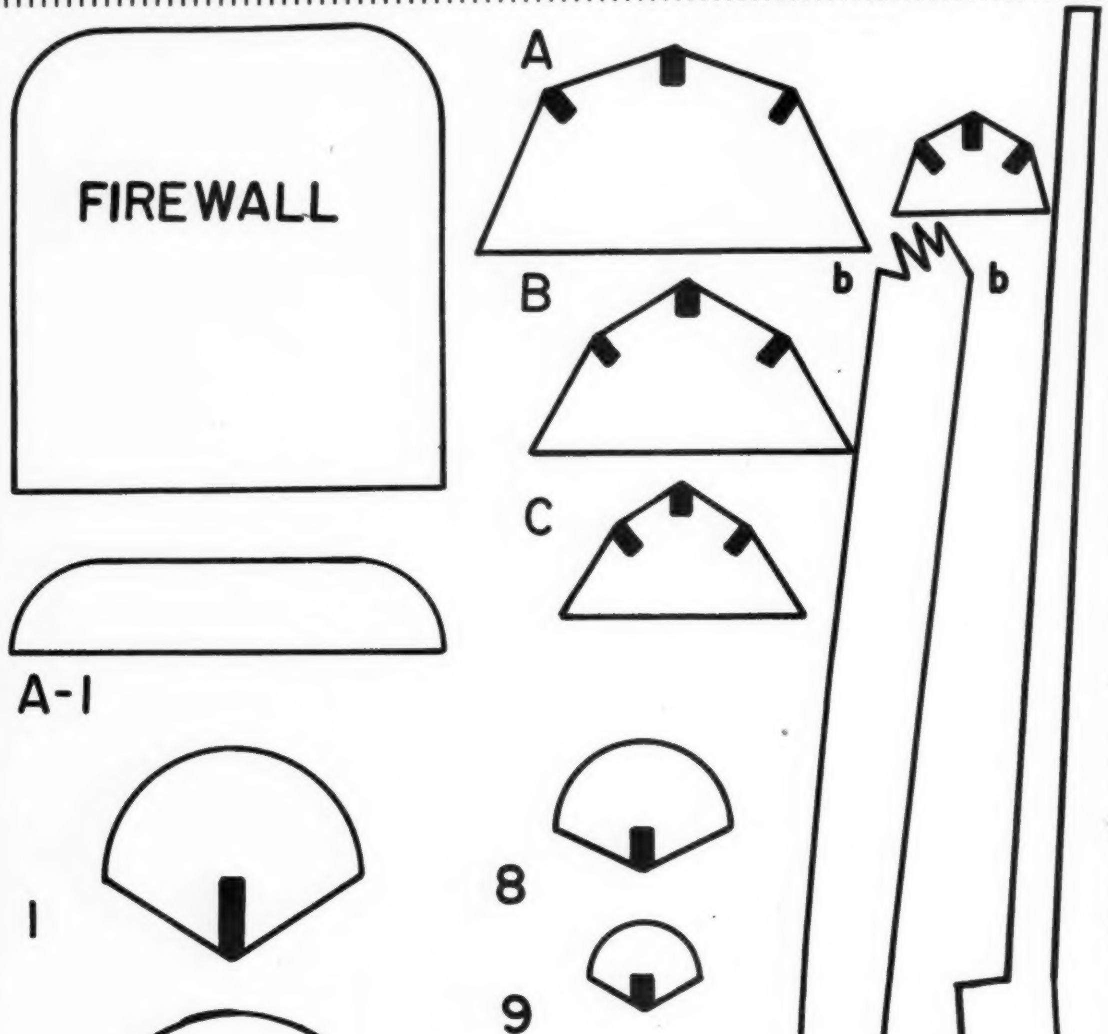
FUSELAGE—Enlarge the side view of the fuselage four times the size shown on the plans. Begin construction by laying the sides out one atop the other as in this way they will be alike. While these are drying, cut out the formers and cement in place. The stringers should now be fastened to the frame. Next the landing gear is bent to shape and bound to the crosspieces, then cemented well. The sides are covered with sheet balsa as shown on the plan. If the *Mite* engine is to be used, cut the cowl to accept the hardwood bearers which must be firmly fastened. Since the Arden engines are bolted to the firewall, bearers are not necessary for them.

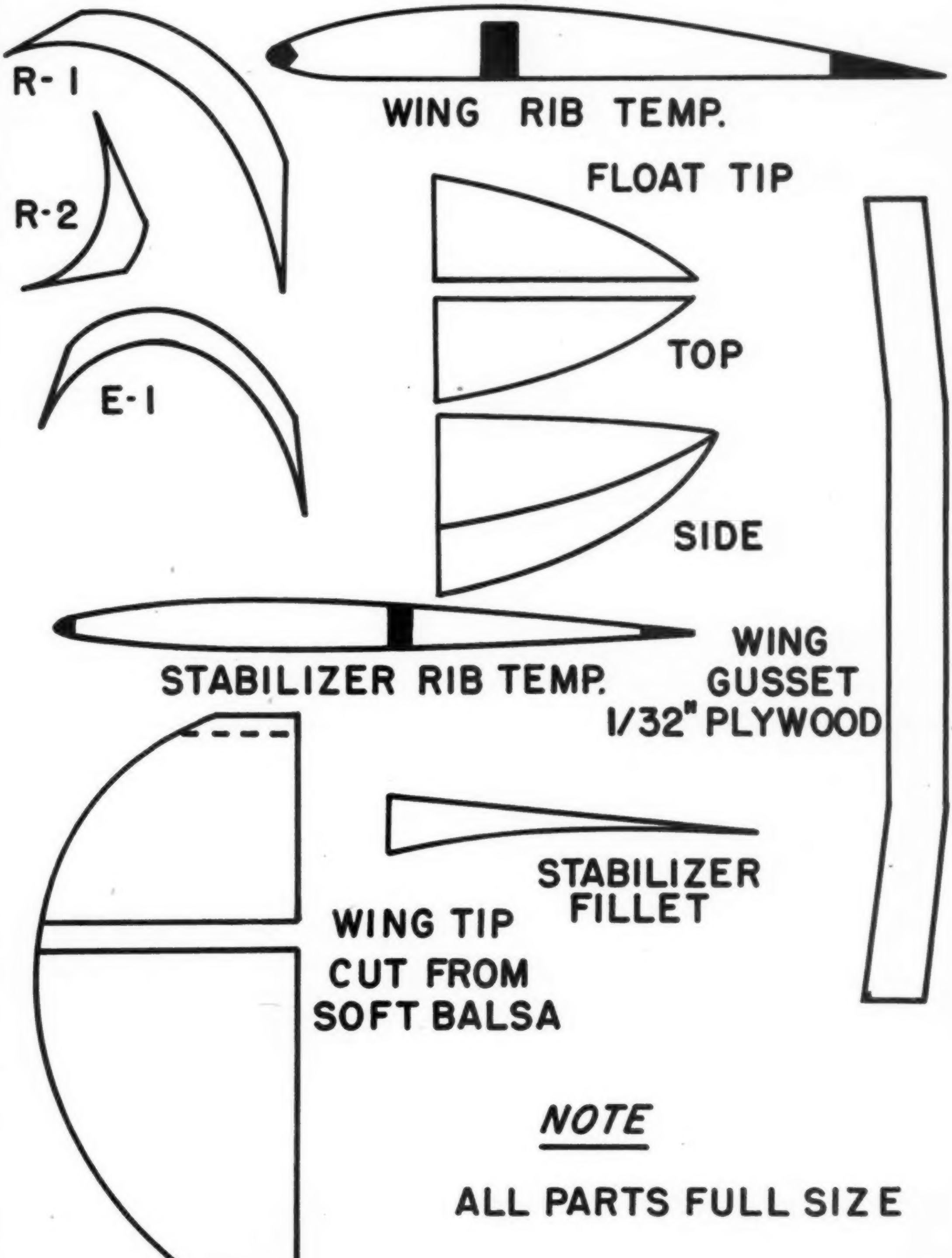
WING—Cut the ribs and spars to shape, along with the leading and trailing edges. Assemble the whole wing in one piece as in this way it will fit better when cut in two halves at the center to form the dihedral. The wing halves are held to the correct angle with the aid of plywood gussets which are cemented to the wing spar. The wing tips can now be cut roughly from soft balsa blocks and cemented in place, after which they should be carved and sanded to shape.

TAIL ASSEMBLY—These plans also will have to be

(*Turn to page* 52)


COVER COMPLETE MODEL & FLOATS WITH SILKSPAN.
DOPE ENTIRE MODEL WELL, (FIVE - SEVEN COATS.
SOLID TIP
LEADING EDGE 1/4" SQ. ON EDGE
GUSSET 1/32" PLY
1-1/2"
THRUST LINE
PARALLEL TO WATER LINE
10"
TRAILING EDGE 1/4"-3/4"
1/4" X 1/2" X 12" HARD BALSA
SEC.
BIND & CEMENT
TUBING 1/16" I.D.
FLOATS COVERED WITH 1/16" SHEET BALSA (C) STOCK
2"
BULKHEADS 1/16" SHEET BALSA
SOLID BALSA
9
8
7
6
5
4
3
2
1
1/8" SHEET R-1
NOTE
COVER SIDES WITH 1/16" SHEET BALSA
1/8" SHEET KEEL
1/8" X 1/4"
1/8" SQ.
21-REQ. 3/32" THICK
FIREWALL
A-1
A
B
C
D
E-1
1/8" SHEET R-2
C.G.
A-1 2-REQ.
FIREWALL
1/8" PLYWOOD
1/16" DIA.
5/32" SQ. HARD BALSA
SET STABILIZER 2° NEG.
BULKHEDS 1/16" SHEET
FLOATS ADJUSTED WITH REAR WIRE
Frank V. B. Ehling


FIREWALL
A
B
C
b
b
A-1
1
2-6
7
8
9
CUT BULKHEADS FROM 1/16"SHEET BALSA
FLOAT KEEL CUT FROM 1/8"SHEET BALSA
b
b


R-1
WING RIB TEMP.
FLOAT TIP
R-2
TOP
E-1
SIDE
STABILIZER RIB TEMP.
WING
GUSSET
1/32" PLYWOOD
STABILIZER
FILLET
WING TIP
CUT FROM
SOFT BALSA
NOTE
ALL PARTS FULL SIZE

No. 1 Tricky canard pusher for control line use flown by W. L. DeGrinder

No. 2 Chris Falconer flies this Fairchild 24 with rubber and towline

No. 3 *DeLuxe* from M.A.N. plans made control liner by H. C. Hillburn

AIR WAYS

News of model airplane experimenters from all over the world

THE 1947 NATIONALS. As announced in our last issue, the Nationals will be run August 18-22 in Minneapolis, Minn. and will be sponsored by the American Legion, which has obtained AMA sanction for the event. Entrants will be picked by elimination at qualifying meets. Also, first place winners in all categories and age groups at the '46 Nationals are eligible, including the National, Senior, Junior, and Novice Champions.

While the Legion is willing to sponsor preliminary meets, it recognizes that many established organizations are all set to handle their own events. Therefore the Legion will only sponsor those meets where no other organization wishes to do the job; it is also ready to act as co-sponsor where this help is needed. Such sponsorship will be handled solely by State and local Legion organizations, not by National Headquarters.

Since the Academy leader members and contest directors will be relied on to supply the technical "know how" for all qualifying meets, it is urged that they contact local Legion authorities regarding sponsorship of State and local meets. It is also emphasized at this point that these qualifying meets in no way affect the normal contest activities of the coming season, and local, state and regional flying meets will be sanctioned by AMA as usual.

It is urged that in those states where qualifying contests have not been definitely scheduled, immediate steps be taken by contest directors, in cooperation with AMA Coordinators and Vice Presidents of their area, to meet for the purpose of planning and scheduling these events.

Such details as: number of contestants for each area or state; point systems to be used for qualification and the like will be published as soon as they are definitely

No. 4 Huge glider built by a member of the Jewish Aero Circle in Palestine

No. 5 Detailed B 25 started by J. W. Ahern while in service

No. 6 This redesigned *Zipper A* was constructed by Don Holmes

No. 7 Solid Vought FG-1 Bendix Trophy racer by Kenneth Maxwell

settled. It has been worked out, however, that the total number of contestants to reach the Nationals will be approximately 600.

Meanwhile modelers are urged to contact their local Legion Posts and apprise them of the fact that there is local activity and interest in model work. Remember, the model builders must *take the initiative*—the Legion in many cases will have no knowledge of the model activity in their vicinity unless it is brought forcefully to their attention.

RULES SUGGESTIONS. Further comment on possible rules changes are being received, and while it is of course too late to effect such changes for the coming season as far as the AMA goes, local contest directors may well try some of the ideas suggested so that they will have solid experience to draw from when the inevitable changes are discussed at the close of the coming season.

One of the charter members of *San Diego Aeroneers* comes up with some ideas that have been tried at their monthly contests and he offers a few that have worked out best. This correspondent, E. J. Brown, is not convinced that dethermalizers should be mandatory because he has had sad experiences with such units which failed to work or worked prematurely. His most radical idea is a sliding scale of wing loadings to help equalize for the results of scale effect in small ships. Thus his organization has found that 8 oz. per sq. ft. for Class A ships, 9 oz. for Class B, and 10 oz. for Class C is very satisfactory. Briefly his program calls for these changes:

1. Increased power loading (should be from 100 to 120 oz. per cubic inch).
2. Equalization of wing loading as mentioned above.
3. Flight time limit of 5 to 10 minutes to speed up contest.
4. Removal of crossection rule as of no consequence with the above changes in effect.

And still the arguments go on—let's hear what other qualified fliers have to suggest.

SUPER CONTESTS are with us again. Those who attended or participated in the N. Y. City Mirror Model Flying Fair last fall will freely admit that it was probably the most colossal model meet ever staged. Many of these same spectators and participants also had other comments to offer—not a few of which were unprintable. We are glad to note, however, that the lessons learned at that event were not lost—we have assurance that the next Mirror Model Flying Fair to be held May 25 (rain date June 1) will be conducted in such a manner that both the contestants and spectators will approve. The location is the same as last year: Grumman field at Bethpage, L. I., N. Y.

The meet will be directed by Tom Herbert, who will have a staff of competent modelers to assist him. One of the first differences we note between this year's meet and that of last fall is that the entry list will be limited to 700—quite a difference from the 1544 contestants who battled for recognition last time. Other (*Turn to page 77*)

No. 8 Hans J. Meier built this glider to test thin wing sections

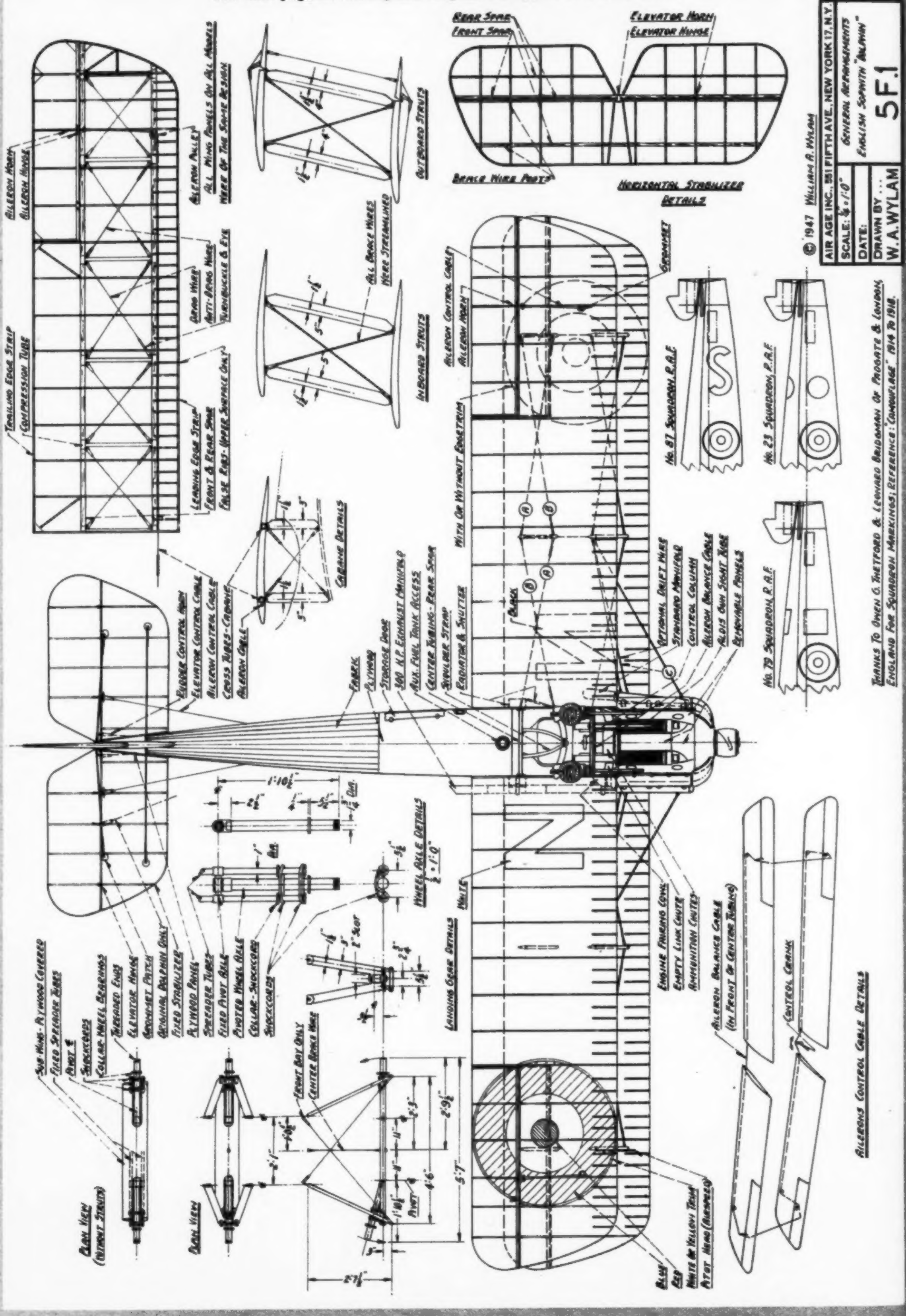
No. 9 This ship did 128 mph with a McCoy engine for L. S. Cook

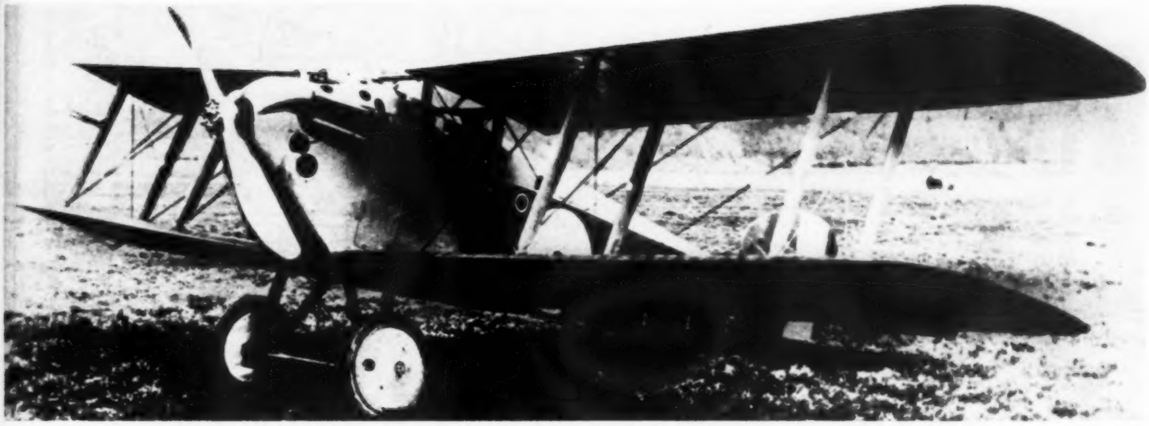
No. 10 Westland *Whirlwind* by Paul Brown is a fine flier

No. 11 Class A free flight trophy winner built by Jim Elliott

No. 12 J. Robertson built this rubber job all over the world

The final page on the Sopwith Dolphin will appear in the next issue





Standard 200 hp Dolphin had a very businesslike appearance; short landing gear is especially noteworthy

WORLD WAR I

by ROBERT C. HARE

DOLPHIN—Part 2

THE first few Sopwith Dolphins allotted to front line squadrons in the spring of 1918 arrived on the scene at an appropriate time. Members of the newly organized Royal Air Force, a body created April 1, 1918, by merger of the old R.F.C. and R.N.A.S., were looking forward to receipt of better equipment with which to wind up the war. More than a little concerned over the rising quality of German aircraft and the employment of "circus" tactics by the Black Eagle's leading aces, Britain's airmen had openly complained of their inadequately performing Camels and S.E.5's. The advantage the R.F.C. and R.N.A.S. had wrested from the Germans by late 1917 was slowly being lost.

While changes in German tactics permitting greater utilization of equipment was a factor in effecting formation of the R.A.F. as an independent organization, arrival of the Fokker D.VII was a particular thorn in the sides of Camel and S.E. pilots. The new German ship was just a little too good for standard British models. State of the British single seat pursuit affairs at this period can best be illustrated by the fact that on March 23, 1918—a week before creation of the R.A.F. —Number 23 squadron, R.F.C. was sent to the Somme Front outfitted with French Spad 13's.

But new and better fighters were coming and with that knowledge the R.A.F. fought on with an anticipatory assurance which made the S.E. boys admire their Camel flying cousins and in turn made the Germans admire them both. The two best bets in service test at Brooklands Airdrome were the Sopwith Snipe (MODEL AIRPLANE NEWS, October 1945) and the Dolphin. Although preceding the Dolphin to the test center by two months, engine production troubles had held up the Snipe. The very existence of these two ships can be credited with helping uphold R.A.F. morale in the crucial early months of 1918.

The School Dolphin

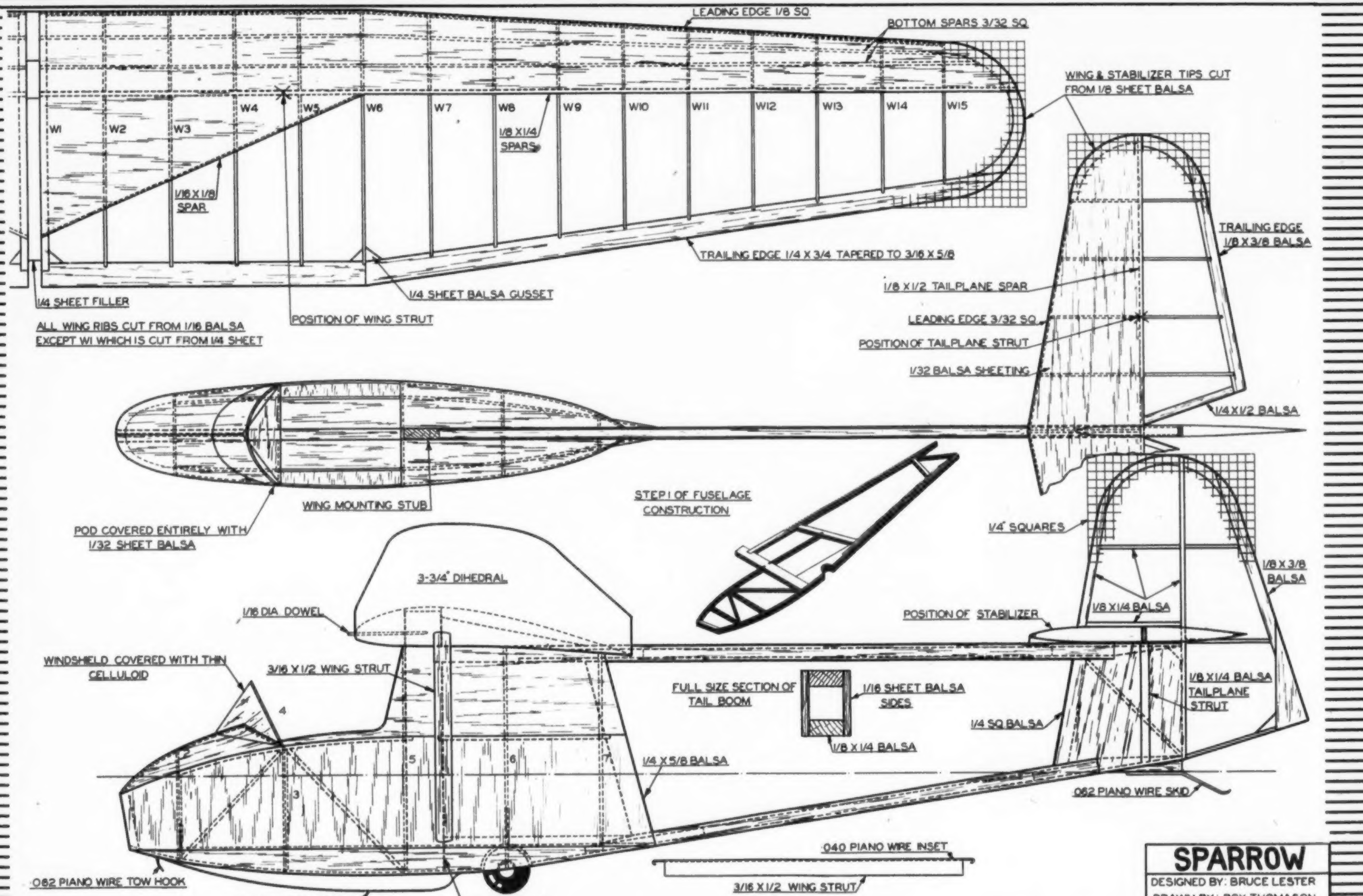
Withdrawal of certain pilots from front line squadrons to attend a special Dolphin training school at Cranwell, England, with the turn of the year was another psychological boost. Ordinarily pilots were introduced to new planes at the Front, but selection for special training on a new type indicated that something really good was coming! Future Dolphin pilots sent to Cranwell were put through a refresher course specializing in operation of water cooled engines. Fully half of these men had flown nothing but rotaries, graduating from Avros to Pups to Camels. Their classroom in the sky was a real Dolphin, equivalent to an advanced trainer, specially rigged and powered by a 180 hp Hispano Suiza engine. In it they learned to fight and fly with more visibility than they had known before. The trainees dove the school Dolphins on ground targets, fired live ammunition from the trainer's single synchronized Vickers. In mock air combat they fired at each other with camera guns and read their progress on a projection screen. They learned to fight and fly at and above 20,000 feet altitude and got their first taste of oxygen through crude masks adapted from standard gas masks.

The trainees learned that the Dolphin, like almost every other military plane ever built, was dangerous. Experienced rumor-mongers, quoting unimpeachable sources, swore that the Dolphin was a

(*Turn to page* 46)

300 hp model had modified cowling and buried machine guns

Training Dolphin of 180 hp carried Vickers and camera guns


LEADING EDGE 1/8 SQ.
BOTTOM SPARS 3/32 SQ.
WING & STABILIZER TIPS CUT FROM 1/8 SHEET BALSA
W1
W2
W3
W4
W5
W6
W7
W8
W9
W10
W11
W12
W13
W14
W15
1/8 X 1/4 SPARS
1/16 X 1/8 SPAR
TRAILING EDGE 1/4 X 3/4 TAPERED TO 3/16 X 5/8
1/4 SHEET FILLER
1/4 SHEET BALSA GUSSET
POSITION OF WING STRUT
ALL WING RIBS CUT FROM 1/16 BALSA EXCEPT W1 WHICH IS CUT FROM 1/4 SHEET
TRAILING EDGE 1/8 X 3/8 BALSA
1/8 X 1/2 TAILPLANE SPAR
LEADING EDGE 3/32 SQ.
POSITION OF TAILPLANE STRUT
1/32 BALSA SHEETING
1/4 X 1/2 BALSA
WING MOUNTING STUB
POD COVERED ENTIRELY WITH 1/32 SHEET BALSA
STEP 1 OF FUSELAGE CONSTRUCTION
1/4" SQUARES
1/8 X 3/8 BALSA
3-3/4" DIHEDRAL
1/16 DIA. DOWEL
POSITION OF STABILIZER
1/8 X 1/4 BALSA
WINDSHIELD COVERED WITH THIN CELLULOID
3/16 X 1/2 WING STRUT
FULL SIZE SECTION OF TAIL BOOM
1/16 SHEET BALSA SIDES
1/8 X 1/4 BALSA
1/8 X 1/4 BALSA TAILPLANE STRUT
1/4 SQ. BALSA
1/4 X 5/8 BALSA
.062 PIANO WIRE SKID
.040 PIANO WIRE INSET
3/16 X 1/2 WING STRUT
.062 PIANO WIRE TOW HOOK
1/4 SHEET BALSA SKID
1/4 X 1-1/8 BALSA
SPARROW
DESIGNED BY: BRUCE LESTER
DRAWN BY: ROY THOMASON
SCALE 1/4"=1"

SPARROW GLIDER

by **BRUCE LESTER**

The Sparrow model ready for a try at thermal hunting

THIS aircraft was first conceived by a prominent Polish designer during the early war years of 1941, and the completed aircraft turned over to the DeHavilland Gliding Club in Canada for training purposes in 1942.

It incorporates the best of Polish design at this period and is really a remarkable machine. Though only of an advanced secondary glider type, it has soared for several hours at the hands of skillful Polish glider pilots who, along with the designer Mr. Czerwinski, were successful in escaping from Poland and making their way to Canada.

The author obtained both A and B Gliding Certificates on the full scale brother of the model we are presenting, and also has the qualifications for C category, to say nothing of experiencing several air tows.

By following the plans carefully, you can build without too much trouble a very fine sport type glider suitable for towline launching. The catapult launch method commonly used in England is an even better system. Use about 25 feet of ⅛" rubber and 75 feet of cord and have some real fun some sunny afternoon on the top of a sloping hill.

But let's get at the construction.

Enlarge the model plan to full size; this makes your model slightly over 5' span. If you care to decrease the scale for a smaller machine you can easily do so from information supplied.

FUSELAGE—First step is to lay out a balsa crutch of the side view similar to the way you would make a side frame for any model; just make one as illustrated. Don't forget to add the packing blocks at top and bottom positions where booms join nacelle pod, and again where they pick up rudder and tail surfaces. With balsa crutch still pinned to an absolutely flat board, cut out all fuselage formers from 1/16" sheet balsa and add each half former at stations 1 to 6 as indicated. Now add top and bottom stringers.

It is advisable at this stage to sheet the entire half pod and the boom as well with sheet balsa, size and thickness of which is clearly given on plan. Before removing from the board, it is best to add the vertical rudder post and build on the entire rudder. In this way you get a model of perfect alignment. Be sure the framework has been allowed to dry, preferably overnight, before removing it from the board.

Clean off all excess glue and wax paper which will have adhered to the frame if you have used the glue as liberally as you should. Add the remaining half formers, and finish up the sheeting and cockpit detail.

Use any type of landing wheel available and don't fail to install the skid that precedes the wheel. This skid should be carefully chosen of hard balsa or pine as it absorbs most of the landing shock.

Sand the whole fuselage thoroughly and cover with whatever color tissue you have, preferably orange for visibility. Paper the booms by winding and doping with strips of Jap paper as you go along. This makes the booms tough and rigid.

WING AND TAIL SURFACES—Ribs are cut from 1/16" thick balsa in the usual manner, being careful to number them properly, especially Nos. 1 to 6. Refer to top diagram of the wing you have drawn up and you will notice that the top notches are made to vary on each rib due to the 1/16" x ⅛" spar which passes through them at an angle. Be sure to duplicate this angle quite accurately as you notch each successive rib Nos. 1 to 6. The root rib should be of harder balsa and of high grade wood as there is considerable strain at this point.

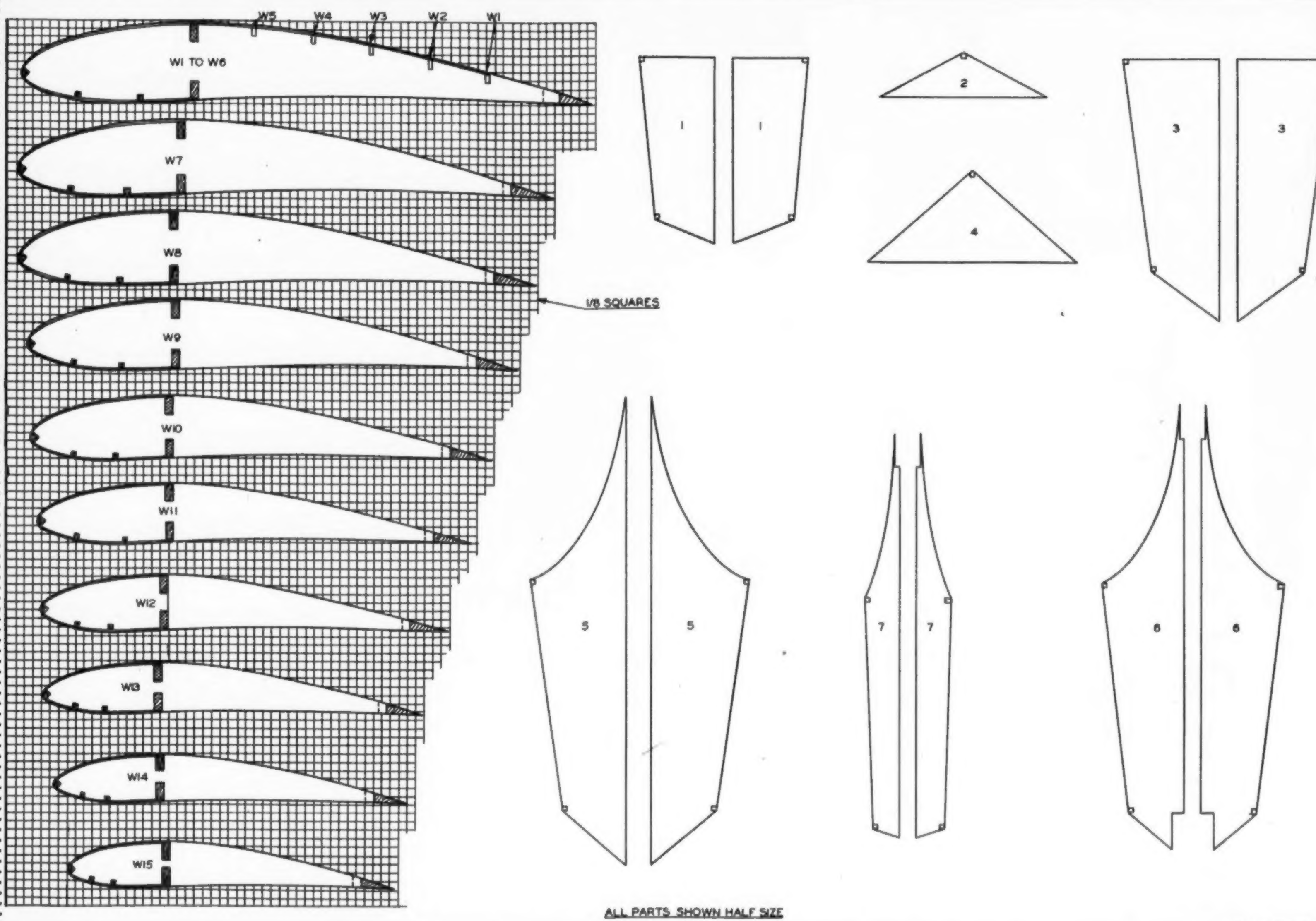
To start wing assembly, pin to wing plan the trailing edges, then lay a spacer 1/32" thick over the plan before pinning down bottom main spar. This spar should be of carefully chosen hard balsa. Now add wing ribs (the spacer strip will allow for the small curvature of the airfoil, and the front of the trailing edge should be raised slightly to assure a perfectly shaped wing.) When satisfied all is in order, add top wing spar of hard balsa, also top sheeting of 1/32" thick stock after you have added the wingtips. When all this has dried thoroughly, remove the wing, panel and add bottom stringers and sheet. Make opposite hand panel using same detailed procedure.

With this much done and the wing nicely sanded, join the two wing panels with a balsa filler block and at the same time glue in the necessary 3¾" dihedral.

Stabilizer is made same way as the wing, using strips of 1/16" x ½" balsa as rib material and rounding them to a symmetrical shape with a sanding block after unit is dry. Be sure to insert ⅛" packing strips under both leading and trailing edges of stab when pinning them down to plan prior to adding stab ribs. When this is absolutely dry, sand the stab to a smooth airfoil shape, then cover and mount on the boom, being careful to get

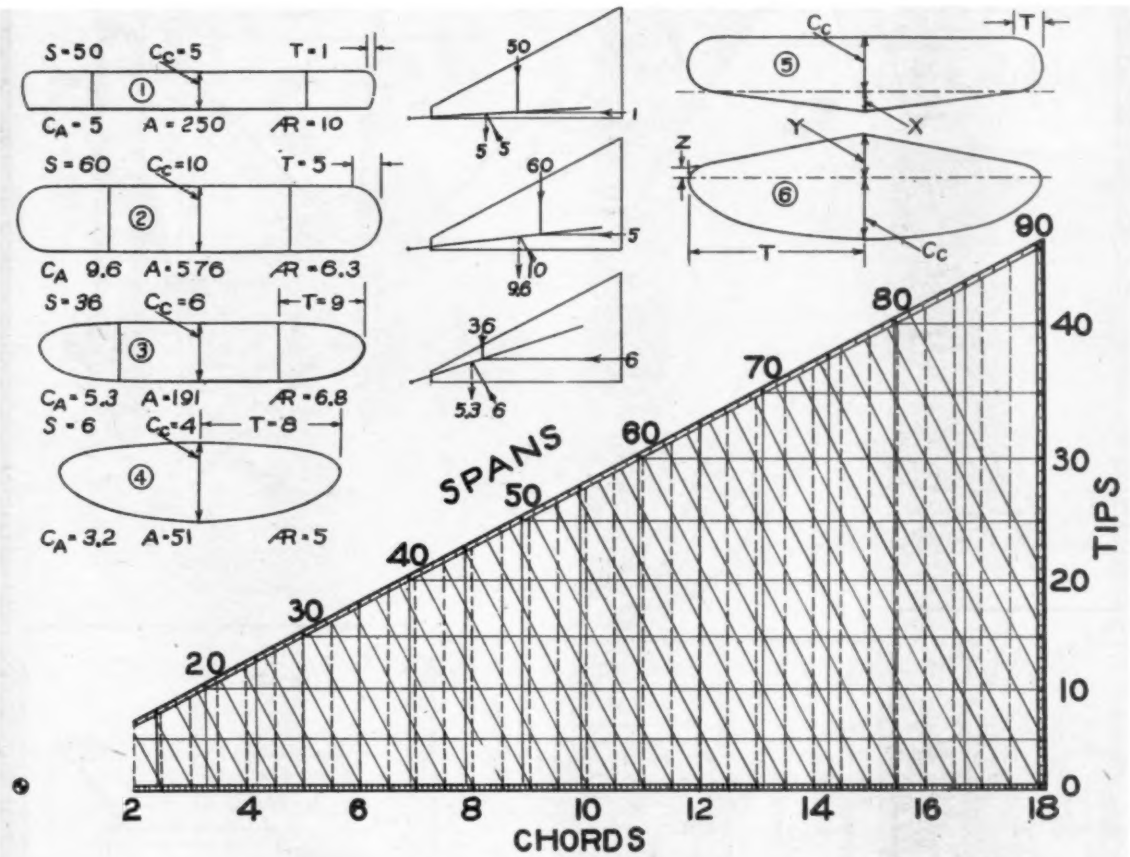
(*Turn to page* 66)

The prototype glider of which our model is a faithful copy is rugged but a good performer


W5
W4
W3
W2
W1
W1 TO W6
W7
W8
W9
W10
W11
W12
W13
W14
W15
1/8 SQUARES
1
1
2
4
3
3
5
5
7
7
6
6
ALL PARTS SHOWN HALF SIZE

D.H. SPARROW

THE CHORD CARD



by **PAUL McILRATH**

Use this painless method to figure your wing area without mathematics

WING Area = Span × Chord
Aspect Ratio = Span / Chord

Sounds too simple to be true, doesn't it? But, friend, those two formulas will hold true for a wing of any shape, *if* the *average chord* (or C_A) is known. Presented here is the Chord Card, a little gimmick that finds the wonder-working C_A graphically; and when it is determined, area and aspect ratio formulas dissolve into the simple multiplication and division operations indicated above.

To prepare the chart for use, just push a pin into the dot at lower left-hand side of the sheet and tie a short length of thread to it. Actual determination of the C_A is performed in three simple steps. As an example of the Card's use, let's take a wing shape popular today and find the average chord.

Such a shape is Number 3 on the graph, and the three necessary dimensions are given just above it: Span (S) = 36; chord at center (C_C) = 6; and length of the rounded tip (T) = 9. On the scale marked "Spans" find 36, and on the "Tips" scale find 9. Then mark the point on the face of the chart where a line drawn directly down from 36 and a line drawn horizontally to the left from 9 would cross. The whole procedure is illustrated on the sample chart just to the right of the wing outline. Mark this intersection with a pencil dot.

The second step: pull the thread taut through the point just marked.

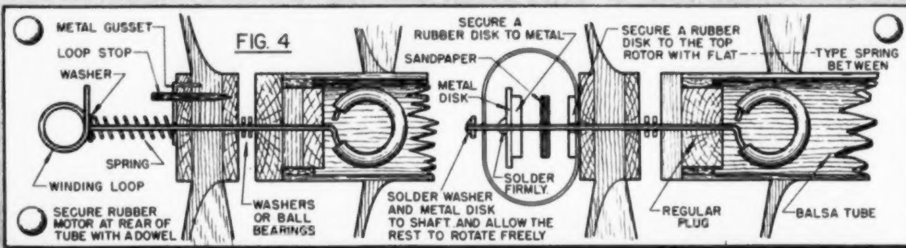
And third: find 6 (C_C) on the "Chords" scale and follow the solid black line diagonally upward until it intersects the stretched thread. From this point, move vertically downward until the chord scale is reached again. This new reading, about 5.3, will be the C_A for this particular wing.

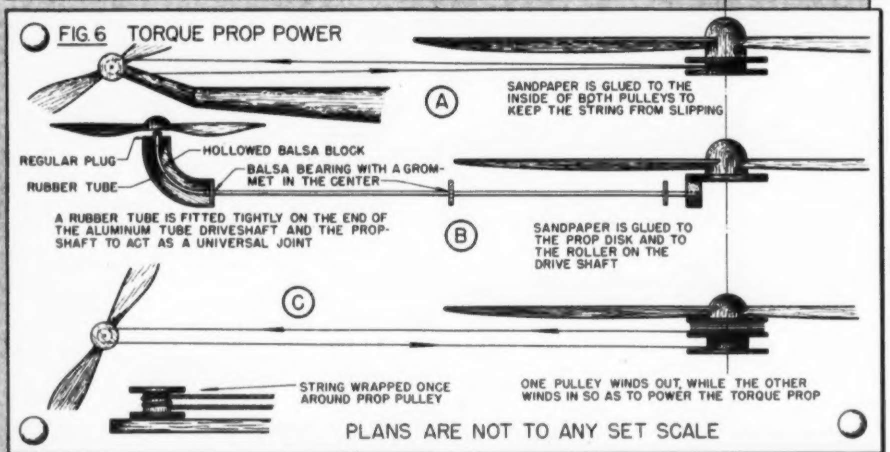
The area will then be: $36 \times 5.3 = 191$. The aspect ratio: $36 / 5.3 = 6.8$. For a check, these values calculated via the formula and slide rule route show the answers to be 193 and 6.74, which ought to be close enough for anybody. Most modellers are used to gauging fractions of scale divisions; however, if you are not it might be a good idea to draw the lines lightly on the face of the chart until you get the knack of it. Just bear these things in mind: S lines are solid and vertical; C_C lines are solid and diagonal; C_A lines are dotted and vertical.

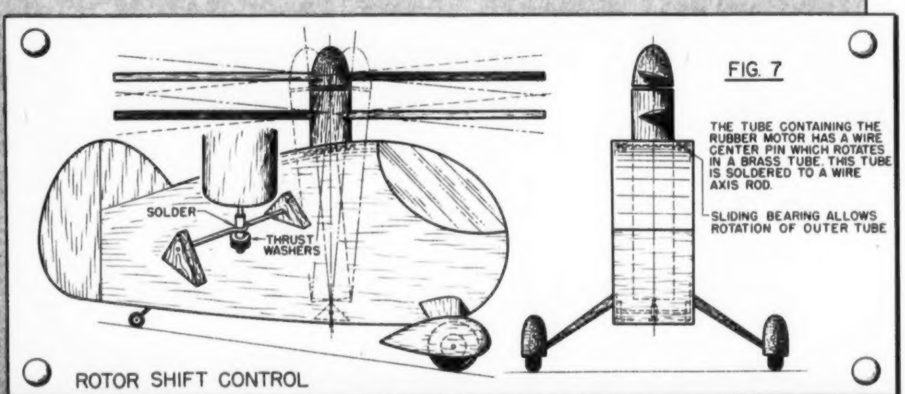
Six different wing shapes are given as examples. If the planform in question does not correspond to one of the first four types, it will have to be subdivided into simple geometrical shapes as in examples 5 and 6. The average chord is then the sum of the average chords of the individual shapes.

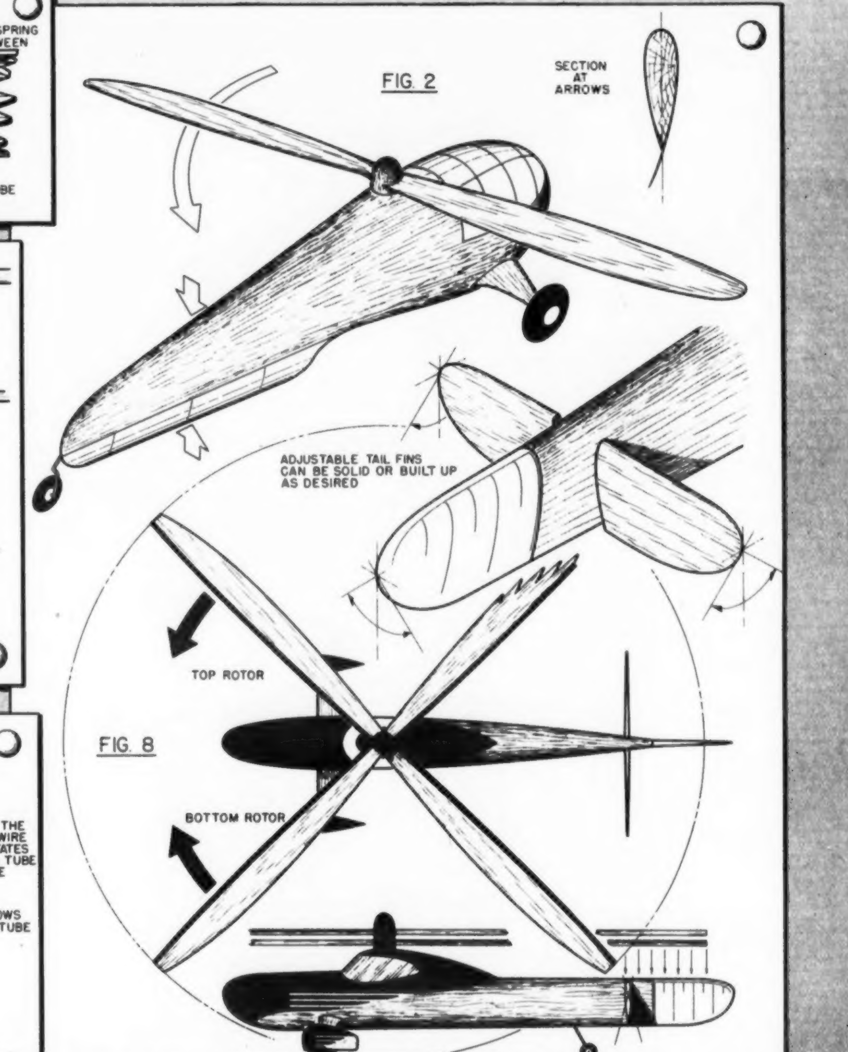
The average chord of a triangle is just half the center chord, so No. 5 is broken into a triangle and an area similar to No. 2. The average chord of the upper section is determined from the chart just as in No. 2. The C_A of the triangular section is distance "X" divided by 2. The average chords of the two components are added to get the C_A of the whole wing.

The average chord of a trapezoid is half the sum of the tip chord and the center chord. Example 6 is divided into a trapezoid and an area that is handled like No. 4. The tip chord and center chord of the trapezoid shown are "Z" and "Y" respectively, so the C_A of that portion of the wing would be $\frac{Z+Y}{2}$. This value would be added to the C_A of the elliptical part which can be found directly from the Chord Card as it would be for a wing of shape No. 4. Proceeding in this way, the most complex planform can be analyzed and even pretzel-shaped wings evaluated accurately.







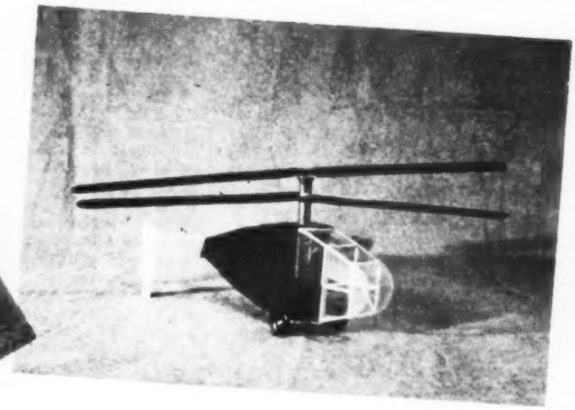


THESE DESIGNS ARE PURELY HYPOTHETICAL, BUT THE THEORIES IN PROPULSION AND CONTROL HAVE BEEN PROVEN. J. T. Holmes.

....MORE ON HELICOPTERS

by R. L. CLOUGH JR.

Twin spool drive of tail prop is used on this model



Coaxial rotors eliminate torque propeller

THE design of a helicopter poses many problems which often cannot be solved by analogy to fixed-wing practice.

In "Basic Design Problems of the Model Helicopter" (M.A.N. Sept. 1945), the writer endeavored to present briefly, and in general terms, several types of flying model helicopter arrangements together with their characteristics.

Since that time two new types of helicopters have appeared, both of which offer interesting possibilities to the model experimenter. Also during this interval, the writer found time to conduct further investigation into the subject and has reached a few conclusions which should be illuminating. Many incidental mechanisms were tried, many discarded and a few retained.

Fig. 1 represents the dual rotor intermeshing machines. The Kellett and Flettner helicopters utilize this form of torque nullification. On full scale machines the rotors are meshed by gearing, but in models it is possible to construct the rotors in such fashion that they mesh of themselves. Use of piano wire sections near the hubs is a fairly good substitute for gearing as well as providing a desirable degree of blade articulation. Both rubber motors should be of the same tension, and winding is best accomplished from the underside. Rotors must be of equal degree of pitch and very well balanced for good results.

Fig. 2 is a single rotor helicopter with torque effect compensation obtained by means of an airfoil shaped tail vane which is provided with an adjustable flap. This type is particularly well adapted to models and will probably be the favorite in future duration contests. It has the disadvantage of over-correcting for torque when fully wound and under-correcting when nearly exhausted, but is otherwise very satisfactory once the proper relationship has been worked out. Rotor speed should be high enough to provide a good slipstream over the vane and slow enough to permit a fair duration. Theoretically the rotor should be as small as possible and of very low pitch. It is necessary to incorporate a cyclic pitch mechanism if forward flight is desired. The CG should come slightly forward of the rotor axis in order to balance the drag of the vane.

To understand thoroughly the difference between helicopters and conventional aircraft—and this understanding is the difference between success and failure—it must be realized that, unlike the airplane, the helicopter is a machine of variables. By way of illustration let us consider a conventional model plane. The *performance* of such a machine is fixed and does not vary; thus at a certain speed a certain amount of lift is produced. The *fundamental* performance is the same whether the machine is under power or gliding; this is because the machine is one distinct mass in motion.

Now, in the helicopter we have the rather paradoxical situation of part of an airborne mass being exposed to a relative wind (the rotors); and part of the mass (fuselage) having no relative wind or greatly varying degrees of relative wind depending on the velocity of the mechanism as a whole through the air.

Let us repeat the above, substituting "kinetic energy" for relative wind. The kinetic energy of a flying machine is the product of its speed times its mass, minus air friction or drag. Thus a helicopter in hovering flight, in calm air, has a relative wind over the rotors, a much smaller amount over the fuselage, and no kinetic energy of the mass *as a whole*. When hovering into a strong breeze the above factors are the same, except that the fuselage now possesses a stronger relative wind; it is in effect flying into the wind at the speed of the wind, but with the important difference that no *momentum* is produced as a result of this forward flight. Therefore, it may be seen that "groundspeed" is an important factor in reckoning performance characteristics of helicopters.

If a helicopter is hovering into a stiff breeze and that breeze suddenly ceases, the machine is apt to drop to the ground (such accidents have occurred). But, if the machine is flying forward at a good rate of speed into the wind and the wind ceases, the momentum of the mass will accelerate it as the air resistance drops and "carry over" loss of altitude will be negligible.

The effects of this differential of inertias are quite marked in helicopters and in some maneuvers can become very complex. In the practical application to our problem of designing stable model helicopters it serves to remind us that it is not wise to go overboard on the matter of "pendulum stability." Too great a distance between rotors and fuselage is likely to accentuate swinging moments rather than minimize them.

Relative wind differentials must be borne in mind as well when designing rotary wing craft. When the fact that the relative wind over the rotors and over the fuselage have different effects is thoroughly digested, many seemingly baffling problems are made clear at one stroke.

Power, the degree of power that is, is another important factor. A rubberband motor's output varies with every revolution of whatever mechanism it drives. This humpbacked power curve of rubber has considerable influence upon the design of models so propelled. Often it is

necessary to alter a design to a considerable degree from what it "should" be in order that stable flight be obtained through all phases of the power curve.

The over-powered model helicopter is lifted rapidly and stops climbing very suddenly—with the effect that inertia may carry the machine a bit higher after lift ceases, permitting the machine to fall free until it attains sufficient velocity for the fuselage area to act as fin surface and invert the model.

The properly powered model rises more slowly, perhaps to a slightly lower altitude, and performs the transition from climb to controlled descent without the weight of the machine being removed from the rotors and transferred to the fuselage at any time.

It may be stated that the ideal power loading for any given model helicopter is the highest which can be achieved without sacrificing desired flight characteristics. More simply: use the smallest possible amount of rubber.

There are several types of flight performance possible: (1) power climb, power braked descent; (2) power climb, free-fall descent; (3) power climb, reverse free-wheeling descent; (4) power climb, over-riding free-wheeling descent; (5) horizontal flight, landing being accomplished while the machine is still under power. (It is almost impossible to secure hovering flight in rubber powered helicopters without using a very tricky automatic pitch rotor head.)

Of these types No. 4 is the most desirable, and often No. 1 is the most practical. Fig. 3 shows a method of obtaining over-riding free wheeling (and, incidentally, automatic pitch). This method can be adapted to either co-axial or single rotor designs, and produces very realistic flights.

If greater simplicity is desired, two methods of obtaining free wheeling by reversing direction of rotation are shown in Fig. 4. Both these methods are adaptable to various types of rotor arrangements. Of the two the coil spring is the most positive, but in some situations the friction disk setup is more practical. Friction disks should be alternately inner tube rubber and coarse emery cloth or sandpaper.

In the previous helicopter article the writer laid great stress on the necessity for well articulated rotor blades to minimize forces set up by gyroscopic action. At this point something called "cyclic pitch" should be explored in some detail.

Cyclic pitch means independent control of the pitch of individual rotor blades at various positions as the rotor turns. By means of cyclic pitch mechanisms the angle of any blade may be increased or decreased as it passes through any segment of the rotor disk. Thus it is possible to increase the lift produced by the rotor on one side and decrease it on the other. This causes the rotor to tilt toward the side on which lift is decreased. Increasing the lift of each blade as it passes through the rear of the disk causes the machine to move forward; increased lift at the front causes it to move backward. Thus the force which is applied to single rotor helicopters to secure forward flight is not a constant thrust as in the case of propeller driven planes but is like a series of "jiggles" which nudge the machine along. This accounts for much of the vibration incident to machines of this type.

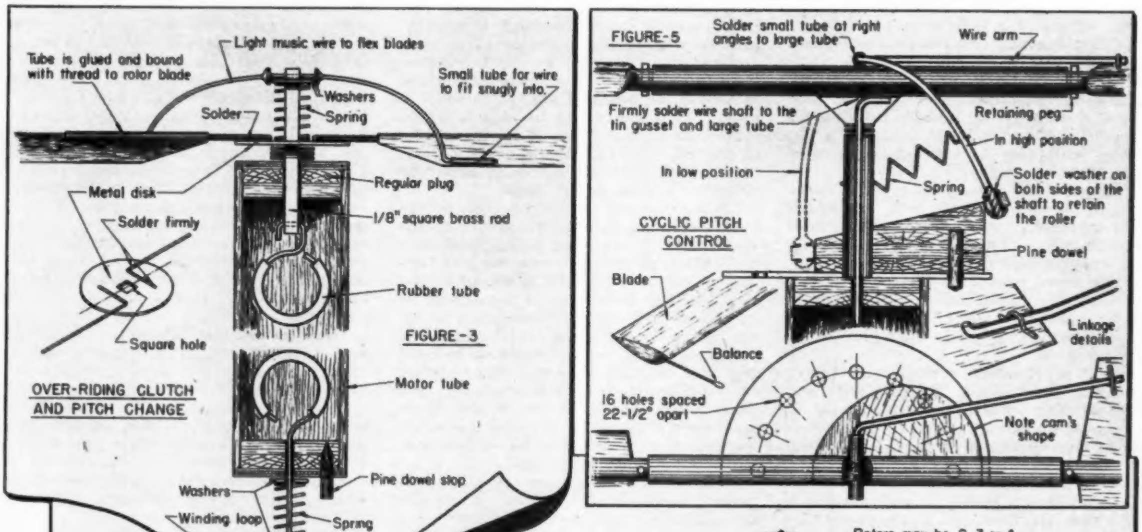
Now it would seem that forward flight could be attained as easily by shifting the center of gravity in relation to the rotor axis, as is done in many co-axial machines, and avoid the vibration caused by cyclic pitch. To a casual observer this appears to be quite logical, but unfortunately the solution is not that simple.

Picture a two-blade rotor spinning in a horizontal plane. When hovering the lift of each blade is equal, that is each blade is moving a similar mass of air downward. Let's assign an arbitrary tip speed to the rotor of, say 100 mph. Now, by shifting the CG of the rotor we cause it to move forward at 50 mph. What happens? The blade advancing into the slipstream encounters a relative wind of 150 mph, its own speed, plus the speed of forward motion; the blade receding from the slipstream encounters a relative wind of 50 mph, its own speed, minus forward speed. Such a difference in lift makes the arrangement unflyable; it simply wouldn't remain right side up.

Therefore, in order to make a single rotor stable in forward flight it is necessary to incorporate a mechanism that will decrease the pitch of the advancing blade and increase the pitch of the receding blade to an extent which will equalize the all-over lift of the rotor disk.

A mechanism for producing cyclic pitch in models is shown in Fig. 5. This is quite simple and produces less friction than some methods that have been suggested. The rotor hub is thin brass tubing through which is slid the blade holder before the blades are affixed. Cyclic control is obtained by means of an eccentric mounted disk which may be shifted about and pinned to secure horizontal flight in all directions. This disk controls the movements of a small wheel or roller, which in turn transmits its movements to the rotor by means of a simple linkage. It is desirable to have a pin and hole setup in the plate upon which the cam is mounted in order to prevent it from shifting while the model is in flight. A light coil spring between the roller arm and rotor shaft is necessary to prevent

(*Turn to page 64*)



ALL BALSA FOLDING PROPS

by N. D. CARLSON

FOR squeezing the last bit of performance out of your small model, try this featherweight all-balsa folding prop. Variations in size will actually produce a folding prop which functions well on indoor type endurance planes. The proportionately huge props used on such models produce an extremely steep glide after the power run. The large frontal area of the prop causes drag which cannot be overcome sufficiently by the momentum of the plane to allow the wings to lift to capacity, and the model sinks rather than glides.

Also, the all-balsa folding prop provides the answer to the need for a folder light enough to be worth its weight on your 15 in. and under wingspan models. The prop is rugged beyond any call you may make on it, and is free of the tendency to wobble sideways at the hinge which the conventional folding prop will develop.

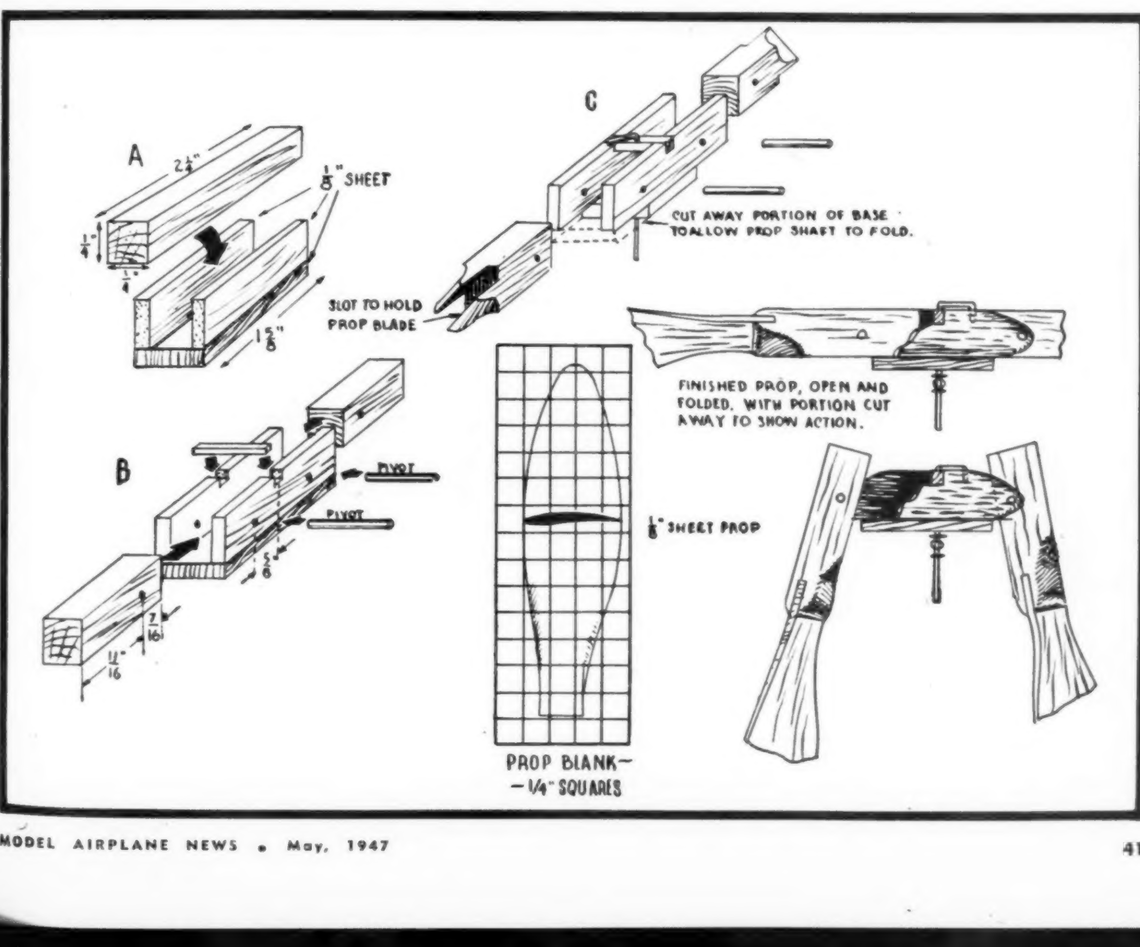
The design is flexible enough to permit many variations in size, shape and weight. The author has made them varying in size from a 5 in. lightweight prop to fit a 10 in. wingspan indoor stick flier, to a rugged 10 in. diameter prop which took the headache out of a large endurance model that previously broke its prop every second landing.

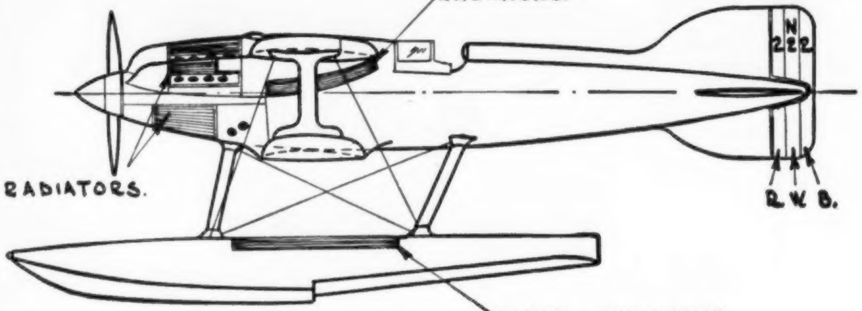
A tensioner may be used with prop on larger models; however, unless shifting rubber weight seriously alters the balance of your ship while in flight, it is unnecessary.

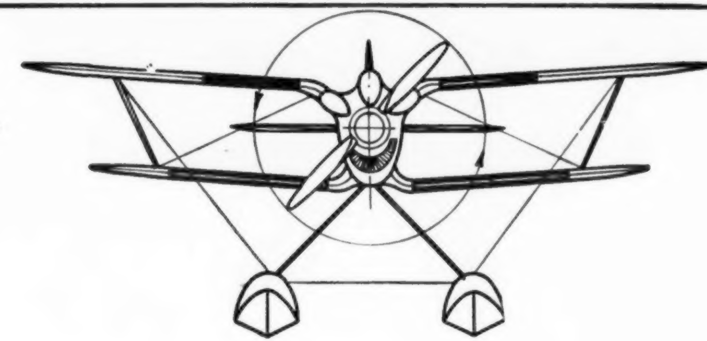
A basic propeller of 7 in. diam., like the one illustrated, is a good one with which to get acquainted with the design and it will be the first one described in the notes on construction.

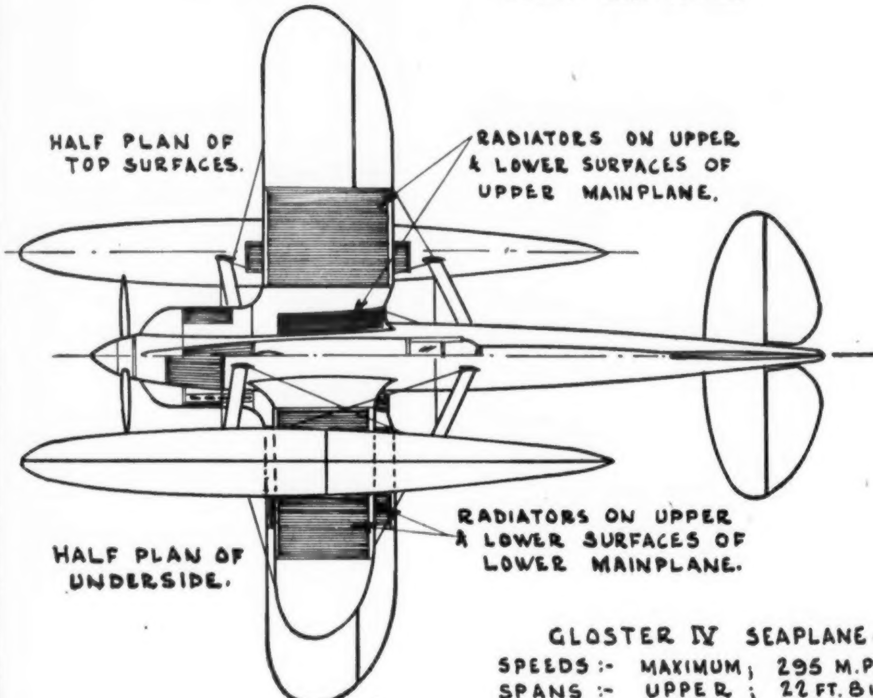
First dig up the following tools and materials: a 1/16" drill, a thin flat file, an *Xacto* knife or razor blade, a small square of fine sandpaper, pencil, rule, and triangle, and if pre-formed prop hooks are not

(*Turn to page 70*)









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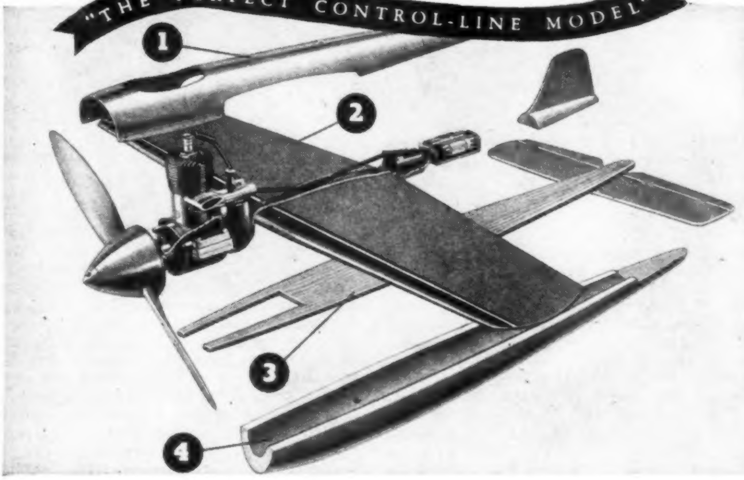

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Plane on the Cover

(*Continued from page 24*)

only 50%.

These same considerations hold true for the reciprocating engine-propeller combination with one important difference: the "jet speed" (the air mass thrust rearward by the propeller) can be easily and carefully controlled, and the airplane can be made to fly normally at practically its "jet speed," thereby resulting in very high propulsive efficiency at all times.

The Army Air Forces' and the Navy's tactical problems vary in detail. The Army saw in jet propulsion a means for creating a super-speed, high altitude interceptor. Its slow speed characteristics proved little hindrance because of the Army's ease in building 5-10,000 ft. runways. The Navy desired the high power possible from jet propulsion, but its seagoing runways are limited to less than 1,000 ft. (frequently less than 400 ft. due to the necessity for parking planes over the rear of the flight deck). Its first jet aircraft project, therefore, was a combination propeller-jet, the Ryan XFR-1 *Fireball*, powered by a conventional Wright R-1820 *Cyclone* engine driving a Curtiss propeller plus a General Electric I-16 turbojet engine in the tail.

This combination proved an immediate success and the FR-1 demonstrated a takeoff distance of 639 ft., a rate-of-climb of 4,665 ft. per min., and a top speed of 405 mph. A similar project was the Curtiss XF15C-1 powered by a Pratt & Whitney R-2800 *Double Wasp* and a DeHavilland Halford turbojet engine. This fighter is considerably heavier, larger and slightly faster than the FR-1, but stability difficulties have slowed its development.

A total of 3 experimental XFR-1's and 66 production FR-1's was completed during 1945 and three squadrons equipped for carrier duty. Service tests with the *Fireball* have proved beyond a doubt that the combination propeller-jet powerplant is a practical and tactically satisfactory solution to the incorporation of jet propulsion to the aircraft carrier. However, the next problem was increased performance, particularly top speed and rate-of-climb. This could have been accomplished by installing a more powerful reciprocating engine in the *Fireball* nose, but the increased weight would have necessitated a complete re-design of the structure and relocation of component parts. The Navy, technically interested in the propjet unit, decided that the *Fireball* might prove an ideal workhorse for experiment with this unit, as well as to provide a basic study of the combination propjet-turbojet powerplant.

The Ryan XF2R-1, our Plane on the Cover this month, is the result of this planning. Basically it is the standard FR-1 *Fireball* with a General Electric TG-100 turboprop unit replacing the Wright *Cyclone* in the nose. The turboprop, hailed from the outset as the most promising immediate solution to the problem of applying the gas turbine to aircraft flying at speeds less than 500 mph, has encountered enormous development difficulties. One major problem has been propeller gearing. The I-16 turbojet engine, for example, has a speed of 16,500 rpm. To keep the tip speed below that of sound, a 10 ft. propeller cannot turn faster than about 2150 rpm. Thus a reduction gear ratio of about 8:1 would be required between the turbine shaft and the propeller.

However, the gas turbine engine cruises at about 90% of maximum rpm, indicating that the turbine engine is a substantially constant speed power producer. To attain the flexibility of thrust required becomes the responsibility of the propeller and its pitch changing mechanism. The rate-of-change of the mechanism must be increased from the present 5° per second to about 15° per second due to the wide power variation of the gas turbine with comparatively small changes in rpm. The solution lies in two-speed or, perhaps, three-speed reduction gearing, a problem extremely complex.

The TG-100 turboprop unit utilizes an axial-flow compressor and "straight-through" individual combustion chambers exiting through the turbine. The turbine drives the compressor, which in turn drives the propeller reduction gearing. About 1700 hp is delivered to the propeller, and approximately 350 hp is provided to a large flush opening at either side of the fuselage in the form of a high-speed jet. This power is achieved at the maximum speed of the airplane, slower speeds resulting in lowered jet hp.

The TG-100 is about twice as long as the Wright *Cyclone* engine but the complete powerplant requirements are radically different. The familiar engine mount, large oil tank and various accessories are eliminated and a compact powerplant assembly substituted. For this reason the XF2R-1 is only about 4 ft. longer than the FR-1. This increased nose length, however, requires the use of a large dorsal fin to provide increased lateral area aft of the airplane center of gravity. The TG-100 drives a large Hamilton Standard *Super Hydromatic* four-blade square tipped propeller to absorb the increased power.

One of the most important technical features of the composite powerplant fighter plane is that the basic operating condition is the total power being supplied by the front engine. The I-16 turbojet engine, both in the FR-1 and the new XF2R-1, is an auxiliary engine only. Under normal operating conditions only the propeller engine is used for takeoff, climb, cruising and landing. The only operating conditions specifying use of both engines are accelerated takeoff, takeoff with an overload, accelerated rate-of-climb, and maximum high speed conditions. The I-16 unit burns about 250 gals. of high octane fuel or about 160 gals. of kerosene per hour, about twice that of a reciprocating engine. The FR-1 for example carries only 380 gals. of fuel in standard tankage, which, with the *Cyclone* burning about 100 gals. per hour, would give the plane a range of only a few minutes more than one hour, or about 425 miles. By operating on the *Cyclone* alone the range can be more than trebled. Another aspect of the range problem however is the standard Navy fighter plane requirement that, in addition to the standard combat radius, fuel must be provided for a 30 sec. warm-up period at full power, 30 secs. for takeoff at full power, 10 min. for idling, and 10 min. at full power at 15,000 ft.

Normal operating conditions indicate a takeoff with both powerplants at full fuel gross weight, climb to 15,000 ft. and level out, followed by throttling of the jet engine. Cruising at reduced power is then accomplished on the propeller engine alone, with the jet engine being started as combat appears and return home on the propeller engine alone.

Carrier operation of jet aircraft poses numerous problems, some of which have been developed by the FR-1 and others that will be introduced by the XF2R-1. One serious feature is the jet blast, which prohibits the interlocking plane stowage so familiar to carrier aircraft operation. A number of proposals were made and studied to solve this problem. One is the use of express elevators and special handling equipment which would bring only two or three fighter aircraft to the deck for takeoff at a time; upon their clearance for takeoff another trio would be brought up. Although much novel equipment has been proposed in connection with this idea, it appears so far that the launching time would be greatly slowed by this procedure. Another suggestion is that special heat-resistant barriers be installed behind each tailpipe, the barriers being retracted down into the deck as each plane moves forward.

The FR-1 has proved admirably suited to carrier operation in this regard, due to the fact that it normally takes off on the propeller powerplant alone. The new XF2R-1 introduces the problem of the jet efflux from the TG-100, but this amounts to only about 15% of that of a straight turbojet fighter and is not expected to present a serious problem provided certain precautions are taken.

The TG-100 turboprop installation has a lower weight per horsepower than the *Cyclone*, but its actual installed weight is about twice as much. The removal of numerous items of equipment permitted thereby, however, results in an increased gross weight of the airplane of only a few hundred pounds. The low specific weight of the turboprop and the turbojet is an antidote to its high fuel consumption. For example, a complete powerplant for a 2000 hp reciprocating engine weighs about 2600 lbs., whereas a complete 2000 hp jet engine installed weighs only 1000 lbs. This difference in weight amounts to about 260 gals. of fuel, or enough for an additional hour's running of the turbojet or turboprop engine. Comparisons between reciprocating and jet engine fighters, then, must be made on the basis of total powerplant weight *including* the weight of fuel. At high speeds (550 mph or more) fuel consumption of the jet engine is actually comparable to that of a reciprocating engine.

The XF2R-1 has a 40 ft. wingspan and is 35 ft., 11-7/32 in. long, 12 ft. 4-1/2 in. high. The air inlet for the turboprop engine is located on the lower segment of the nose with internal ducts carrying this ram pressure air across the propeller reduction gear box and into the air compressor intake. Air for the turbojet engine is taken in at the root of the wing leading edge, is carried rearward and into the fuselage where the duct enlarges to a bell-shape for entry into the turbojet air intake. The rear fuselage is attached by four bolts which, upon removal, permits the aft section to be moved back, exposing the turbojet engine for servicing. The engine is actually mounted on a trolley, permitting it to be rolled forward and aft for removal and installation.

The XF2R-1 was completed in October 1946 and delivered to Muroc Army Air Base, Calif. for flight tests in November. It completed the first "cross country" flight of an American turboprop airplane recently when it flew from Muroc to the Ryan factory in San Diego. It shares honors with the Consolidated-Vultee XP-81 as the only turboprop aircraft of American design to have been successfully flown.

World War I

(*Continued from page* 33)

pilot-killer; its wings fluttered at 200 mph, broke away completely at 250 when dived, and the plane delighted in squashing pilots if it turned over on its back. While these things may have been true of experimental models, they certainly were cured in production and school types—and to prove it, Dolphin trainees were thoroughly familiarized with the service type they were to fly in combat. In this phase of training the 5F.1 was laid bare and explained piece by piece by R.A.F. engineering specialists in Dolphin anatomy.

Construction, 200 HP Dolphin

Dolphin structure, trainees found, was as simple as its design was unconventional, and in spite of its odd appearance the uncovered airplane was found to be exceptionally rugged. With an eye toward production economy, all four Dolphin wing panels were basically the same and differed only in location of interplane strut and bracing wire fittings.

Each wing panel was framed of 14 full plywood webbed ribs mounted on two wood spars. Trailing edge was milled to shape from solid spruce as was the leading edge. False or nose ribs spaced between full ribs extended on the upper-surface back to the front spar. Ailerons were interchangeable between upper and lower planes merely by relocating the fittings. Lower wings were attached to fittings on the lower longerons, while upper panels were attached to a steel tube framework supported from the fuselage by four solid streamlined spruce struts. The tubular assembly itself was square, the front and rear tubes in line with and acting as a continuation of the upper wing spars. Longitudinal tubes served as compression members. The centersection was unbraced in the plane of the front struts to permit location of guns, sight and windshield. Wire bracing was employed, however, between front and rear struts. Since the fuselage almost entirely filled the centersection gap and cockpit, access was through the tubular framework's open top; this structure was unbraced in the horizontal plane.

Prototype Dolphin tests which indicated the need for more vertical fin area resulted in the final peculiar configuration shown in the illustrations. The vertical stabilizer was wood framed and wire braced to the horizontal stabilizer. The balanced rudder followed the same construction but incorporated a steel tube spar.

Horizontal stabilizer employed one wood spar and a steel tube trailing edge to which were attached ribs of symmetrical non-lifting airfoil section. Eye bolt fittings on the upper longerons and clips on the front spar held the tail plane in place. The stabilizer was adjustable on the ground by a nut and screw arrangement between the trailing edge tube and the fuselage sternpost. Elevator was a one-piece member with a divided trailing edge, composed of a wooden spar and ribs. Steel strap hinges held it to the stabilizer.

Fuselage

Deep bellied and slab sided, the Dolphin fuselage was symmetrical in plan view throughout. The ten-side struts were vertical relative to thrust line, which fact pleased R.A.F. riggers no end. Vertical and horizontal struts were attached to the four longerons by means of

(*Turn to page* 49)

stamped steel clips and each bay thus formed was steel wire braced. Lower longerons at number 2 upright were inclined upward and forward and attached to the upper longitudinals by means of a large steel stamping formed to fit around the engine's forward crankcase. Ash engine bearers were attached to this same stamping and to smaller fittings on the first and second uprights.

A steel firewall behind the engine prevented fire or fumes from entering the cockpit. The pilot's seat, mounted over the Dolphin's 32-gallon fuel tank, was adjustable vertically and fore and aft. This not only permitted various sized pilots to fit in the cockpit, but it gave individual pilots an opportunity to change position according to the dictates of comfort or visibility. The fuel tank was equipped with a filler neck and cap which was reached through an access hole aft of the cockpit on the left side. The Dolphin's cooling system consisted of two permanently fixed radiators with self-contained header tanks, one on either side of the cockpit. Radiators were shuttered by a simple door-like aluminum plate normally flush with the fuselage side surface, but which could be opened outward to cover the radiator and thus reduce cooling or inwards to expose more of the radiator according to flight requirements.

Cockpit controls and instruments were conventional for the operation of a Hispano Suiza powered pursuit. Ailerons were actuated by stranded cables running on pulleys to reduce friction. Elevator cables were single but rudder cables were in duplicate. Both rudder and elevator cables ran through highly polished ferrules resembling pitot tubes, rather than pulleys where their direction changed. To facilitate turning on the ground the Dolphin tail skid was steerable through the rudder bar.

Seated high relative to the basic fuselage structure, Dolphin pilots were protected fore and aft by deep fairings which almost filled the wing gap. Fairing to the rear was built up of 10 formers and 7 stringers, fabric covered except between cockpit and the second former aft. This area was aluminum covered, contained hand- and foot-holds for access to the cockpit and was, of course, strong enough to support a man's weight walking on it. The upper metal fairing forward of the cockpit cowled the engine and partly concealed the twin Vickers machine guns. It was well supplied with circular cutouts which not only provided access to various engine parts but assisted engine cooling. The upper cowl also was cut out around the protruding engine cylinder banks. Two side cowls equipped with circular cutouts and hinged access doors and a rounded under-the-nose cowl completed external elements of the engine section.

Because of the deep fuselage, the Dolphin landing gear was short and very rugged. Landing gear struts were streamlined section solid spruce members attached to the lower longerons by husky steel stampings. They were joined at their lower extremities by sheet stampings through which the split axle was inserted and to which the rubber cord shock absorbers were fastened. The spreader bar consisted of a steel tube behind and in front of the axle. Bracing wires were placed in the plane of the front struts only.

The 300 HP Dolphin

As Dolphin construction somewhat caught up with demand from the Front,

its designers began thinking in terms of more power and performance to bring the 5F.1 up to par with other newer types slated for 1919 production. Because it was a definite success and in addition simple to build, a sample 5F.1 was equipped with a 300 hp Hispano Suiza engine and suitably beefed up for tests. Results proved most encouraging, but production loads on British factories precluded manufacture of the new Dolphin in view of the fact that facilities had been assigned to newer and slightly better performing types with which to finish the war.

Meantime the French Air Ministry, which also had been making preliminary tests with the 300 hp Dolphin because it furnished the engine, put in a bid to build the plane under license in France. Although details are obscure, it is known that tooling was being made for production and that some of the planes were to go to the A.E.F. Although the entire project was dropped at the Armistice, at least six Dolphins, standard models modified for the bigger engine and to new specifications, were constructed.

Outwardly, the 300 hp Dolphin was almost identical in appearance to its 200 hp cousin. Because of varying load requirements, however, the tail plane was made adjustable for in-flight trimming and fuel capacity was increased nearly three times to 84 gallons. Armament was standardized with two .303 Vickers synchronized guns completely buried under the upper nose cowling and firing through blast tubes. The nose was redesigned to take the larger engine, and under-the-hood modifications were made which included installation of a telescopic type carburetor air intake tube opening at the front cowl to reduce the hazard of carburetor fire.

Dimensionally, the 300 hp Dolphin remained about the same as its predecessor but it was appreciably heavier and faster. Its empty weight was 1566 lbs. and gross weight 2358 lbs. In this respect it is interesting to note that this airplane was one of the few W.W.I types in which power loading (7.5 lbs.) was less than the wing loading (9 lbs.), indicating a trend in military aircraft that has persisted to this day. Rigged and trimmed to give better performance at altitude, the new Dolphin climbed to 16,400 ft. in a shade over 12 minutes and had a service ceiling of 24,600 ft. Its top speed at 16,000 ft. was 133 mph; 140 at 10,000 and 147 at sea level. Landing speed was 45 mph.

Although the Armistice put a stop to Dolphin production, the R.A.F. put them to good use for some time as advanced trainers and communications machines. Dominion air forces were given a great many Dolphins to form the nucleus of their individual air arms. Without a chance to prove its worth over a long period of time in multiple squadron strength, the famous 5F.1 Dolphin can nevertheless be regarded as one of the best Allied pursuits of W.W.I.

Skipjack

(*Continued from page* 26)

enlarged four times the size shown. Cut the ribs and cement in place along with the tips. Sand the entire assembly well and re-cement all joints since a weak frame is bound to twist out of shape.

FLOATS—The job of building the floats is not as hard as one may think so don't just put a pair of wheels on and miss all the sport that goes with water flying. Cut out the bulkheads and keel and fasten together as shown on the plan. Now the floats are ready to be covered; and while some builders will be tempted to use balsa sheet covering the author prefers planking because with this form of construction the float has less chance of getting out of line. The bottom of the floats must be covered first; then cement the crossbraces in place along with the tubing that holds the landing gear in place. After the floats are planked with balsa they must be covered with a good grade of gas model paper; this will help hold them together when the ship has to land on the ground.

COVERING—Cover the ship with care and the reward will be a neat job; this is easy to attain if the covering is applied wet over the frame and cemented around the edges with cement thinned 50%. Dope the ship; and since she will be used around water do a thorough job. We gave the ship many coats of dope until the water would roll off; about three coats of clear and ten of color were used as the dope was thinned out 50% so it would go on without piling up.

FLYING—The engine should be well tested before it is installed in the ship to catch any possible troubles. Assemble the model and set on the water; start the engine for a short slow run and see how the ship rides on the floats. If it noses up and the front of the floats come out all is well; however, if the ship doesn't nose up, increase the length of the rear strut until it will. When full power is applied the ship should take off and land well. After it lands note whether it rests with the nose low and the tail high. If it does, you have found the secret of getting your seaplane off the pond.

Newsletter

(*Continued from page* 11)

sporting fields (golf, for instance) it has been suggested that classes might well be:

Junior—under 16 years.
Intermediate—16 to 21 years.
Senior—over 21 years.

Personally, the "intermediate" sounds a little schoolish. But maybe not. What's wrong with *junior*, *senior* and *adult*?

Speaking of rules, "the fewer the better" claim a lot of folks who have run big meets and won top prizes. Last fall the New York City *Daily Morror's* meet was run on an honor basis under which the entrant signed a statement that his or her entries conformed with all the requirements. Only in the event of protests were models processed. The scheme seemed to work out surprisingly well.

And here the modelers thought they were pioneering something new—but not at all. This has been the practice in England for quite some time according to reports from that country. And it works very well there. Guess there's nothing much new under the sun after all.

How does the "honor system" of no processing strike you?

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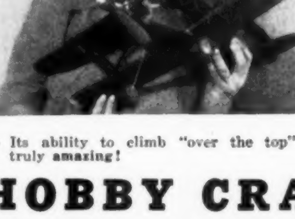

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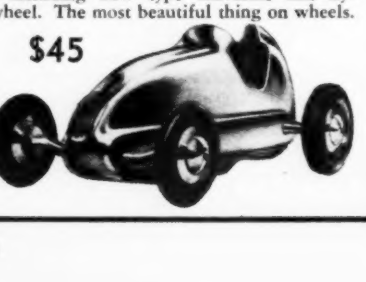

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Design Forum

(*Continued from page 20*)

bility and proper relation between power-on and gliding flight. There are other arrangements which are also suitable but which result in less efficient flight or shorter duration. For instance, forces can be arranged to suit a low wing design or a flyingboat. Such an arrangement is indicated in Fig. 6. This force setup is basically the same for both these types.

In the past the design of any airplane was dictated chiefly by structural convenience or fancy, rather than by the necessity of having a fixed and balanced force setup. Observe that in Fig. 7 the center of lateral area (CLA) is slightly below a line passing through the C.G. parallel to the thrust line. This gives great stability and its position has been fixed by the particular design or shape of the fuselage, the placement of the wings and the line of thrust.

Now that we see where to place these forces it is necessary to know how they are generated and how their point of reactions can be determined. Lift (L) at normal angles of attack acts at a point 45% to 50% of the chord back of the wing trailing edge. The center of lift of each wing half is approximately 40% outward from the wing center toward the tips, Fig. 2. Total center of lift of the wing is at the mid-point (WR) of a line connecting these two points, Fig. 2. So we see the center of lift actually is above the center of the wing as shown in Fig. 1 and Fig. 2. The center of lift changes, however, as the angle of attack increases.

In a climb the attack angle increases to as much as 5° or 6°. The center of lift then moved forward toward the leading edge and approximately to the point shown in Fig. 1. The dotted arrow (L_G) indicates the lift forces in climb acting at this new center of lift. The center of resistance is always an elusive force because it is impossible to determine it with complete accuracy without wind tunnel tests. We know that the center of resistance or drag of the wing will act at the center of lift of the wing (WR), Fig. 2 under normal conditions. However, the center of lift of the total airplane is a combination of wing drag plus drag of the fuselage, landing gear, tail planes, etc.

A practical way of determining the approximate position is to make a silhouette of the forward projection of your airplane less the wings. Cut out this silhouette and find the point at which it balances perfectly. This is approximately its center of drag. Usually the wing drag of a model plane is 60% of the total drag, so we can divide the distance between the point (FR) fuselage resistance and (WR) wing resistance into the ratio of 40-60. In other words, (TR) the total drag of the airplane will be located 60% of the distance between (FR) and (WR) upward from (FR) as shown in Fig. 2.

This point (Fig. 2) or line (R, Fig. 1) does not remain in the same position, however. In climbing flight it rises because wing drag increases more than the drag of the body, when climbing, in the average airplane. Again, there may be exceptions to this due to a particular shape or design of the fuselage. At steep angles of climb approaching the stalling point the line of resistance actually drops due to the drag of the stabilizer and the rear of the fuselage which has dropped below the C.G.

Now how are we going to set up these forces so their movement will correct any

flight deviation? For high wing or parasol types, Fig. 1 is an excellent setup. In level flight (W) is directly below the lift and balances it so they do not create disturbing moments in level flight. The thrust pulls forward while the drag (R) pushes backward above the thrust. This creates a nosing up couple or moment. That must be balanced if the airplane is not to loop abruptly. Consequently the stabilizer is placed at a slightly positive angle approximately 1° so that it generates a lift force (S). This force times its distance from C.G. or line (W) acts as a corrective moment tending to hold the nose down and should be of such magnitude that it exactly balances the disturbing moment of the couple (RT) in level flight.

It has been found from experience that the value of 1° in the average stabilizer produces a corrective moment slightly smaller than the disturbing moment (RT). This is necessary because we wish the airplane to climb. The problem now is to keep it from nosing up beyond a certain angle; in other words, the change in the force setup as it noses up should increase until a complete balance is reached at the desired angle of climb.

We will assume that our airplane has nosed up and reached this desired angle, as in Fig. 3. What changes have taken place to overcome the nosing up tendency of couple (RT)? First, the lift (L) has moved forward; weight (W) however has also moved forward relative to the old lift position because the center of weight is below the center of lift. Consequently forces (L) and (W) are still directly over one another and are balanced. However, the wing drag (D) has increased, which has raised the total resistance (R) to position (R_C). On the other hand, the whole airplane is flying at a greater attack angle due to its slower speed in climb. Consequently the stabilizer angle has increased considerably. Though the airplane is flying more slowly the *percentage increase* in stabilizer angle of attack is much larger than that of the wing because the wing originally was set up at a larger angle. Consequently, the stabilizer lift relative to wing lift is much greater so that corrective moment (S) times (M) is greatly increased. This increase is in much greater proportion than the increase in disturbing moment (M_B) times (R_C). In effect it has increased sufficiently to balance exactly the couple (T-R_C). The airplane therefore remains at this fixed angle of climb until some one of its forces changes. Usually such a force is the thrust.

Sometimes a gust will hit the wing and increase the life (L) or drag (R_C). Their reaction will cause a nosing up effect with a corresponding reaction on the tail to produce recovery. One of the ways in which total disregard and misunderstanding of flight force reactions are shown is in persistence in placing the thrust line below C.G. In Fig. 3 thrust (T) is slightly above C.G.; the reaction of force (W) parallel to the thrust line is indicated by (W_B); so we see that the combination of (W_B) and thrust (T) creates a nosing down couple which tends to prevent the model reaching the stalling point, because as the climb angle increases and approaches the stalling point, this couple increases until we reach the maximum condition shown in Fig. 4. Here the airplane is rising vertically. Its flight speed has been reduced to a minimum; consequently the lift force (L) and stabilizer force (S) and resistance (R)

(*Turn to page* 59)

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are infinitesimal. Any reactions they may cause are balanced as in horizontal flight, Fig. 1.

The important point is that the airplane's total weight is being raised by the thrust (T_S), so that we have (T_S) lifting and weight (W) pulling down. This reaction produces a nosing over or stable moment indicated by the curving arrow to the right of (T_S). Placing the thrust line above C.G. therefore tends to prevent recovery from stalls.

Now let us place the thrust line low, as in most airplanes flown in contests today. This position in Fig. 4 is indicated by curved arrow (T_U). As this airplane increased its climb angle due to terrific speed it has nosed up more and more. During this process the lift has become progressively less and the thrust has increased due to the slower flight speed, until the airplane has assumed a vertical position as indicated. Here we have the forces (T_U) acting to the left of weight (W), producing a moment (M_U) times (T_U). This moment reacts as indicated by the arrow to the left of (T_U) and tends to nose the airplane over on its back or turn it into a sharp loop. To show how naïve many model builders are, they turn this inherent fault into what appears to be a virtue. They offset the rudder slightly, so that instead of looping when the airplane is pulled into a sharp stalling position by the low line of thrust, the nose turns sideways as it reaches stalling point and the plane turns into a sharp spiral.

Many model builders believe this to be a virtue, but it is a virtue only as it corrects an inherent fault in the airplane at the expense of duration; any spiral absorbs useful power because the altitude gained is not proportional to the power expended, as is the case when flight assumes a straight and steady climb. This is the one remaining scientific advance that can be made in models today that will increase duration: designing a model so that instead of spiraling it will climb straight and steadily until the motor finally cuts.

Another benefit in placing the thrust line above the C.G. results when the motor cuts and the ship starts to glide. Many a plane will stall and then dive sharply before it levels off into a glide. This maneuver loses valuable altitude and duration and is usually the result of a sudden nosing over moment produced at the instant the motor cuts. For instance look at Fig. 3. Under power, force (T) pulls the airplane forward and upward. When this cuts, the inertia of the airplane acting at its center of mass or C.G. pulls the airplane forward. When C.G. is below the thrust line it is obvious that at the instant of cutout the pull comes below the thrust line which tends to hold the nose up and prevents diving suddenly. The reaction of the airplane mass decreases gradually until the gliding angle is assumed, then remains constant under the pull of gravity. If the thrust line is low, as in position (T_U) Fig. 3, the plane is adjusted for steady climb with this low thrust position. Then when thrust ceases suddenly, the nose ceases to be held up by the thrust; instead, the C.G. does the pulling at a point higher than the thrust line (T_U), thereby producing a nosing over moment equal to the force (I) times the distance between (I) and (T_U). This throws the airplane into a sharp dive instead of tending to hold the nose up as is the case when the thrust line is high.

Model builders have various ideas as to how to arrange wing, stabilizer, and

center of gravity. Sometimes they feel it is not important. However, look at Fig. 5 which shows a setup often used by model builders. The C.G. is moved forward relative to Fig. 1, to a point approximately 1/3 of the chord back of the wing leading edge. The stabilizer is set at zero. The forces (R), (T) and (L_P) have the same arrangement and intensity as in Fig. 1. There is no tail pressure because the stabilizer is at zero (zero here means the stabilizer is set at an angle which gives zero lift). Instead of the stabilizer reaction overcoming the nosing up effect of moment (M_R) times (R) when in level flight, the couple (W) times (M_L) is used to balance it. This is a setup used often in large aircraft. When the model climbs the center of lift moves forward to (L_G), and due to the increase in angle of attack the stabilizer starts to lift, generating an upward force which corrects the nosing up effect of resistance (R).

Airplanes will fly and climb well with this arrangement when under power. However, when the power cuts and they start to glide they will glide much more steeply than the plane with force setup of Fig. 1, because the C.G. is farther forward. This tends to pull the nose down more sharply. Wing and tail in this setup have the same difference in angle, or the same longitudinal dihedral as in Fig. 1. The drag (R) is in the same position and has the same intensity. Therefore the airplane will be in the same balance in Fig. 1 except for the forward position of the C.G. It is obvious that the glide will be steeper because, if the C.G. is moved backward it will weight the tail more and tend to pull up the nose; so we can say that in airplanes arranged as in Fig. 5 there is a greater difference between climb angle and glide angle than in planes arranged as in Fig. 1. Planes of the latter type will glide more flatly for any given climbing angle.

Some of our readers have inquired about low wing setups where thrust line is above the wing. In such types the line of resistance (R) is below the thrust line (T) instead of above it, Fig. 6. The lift (L) and weight (W) are placed directly above one another, 50% back from the leading edge. Resistance (R) generates a nosing over moment (M_R) times (R), instead of a nosing up moment. To correct the nosing over moment the stabilizer must be set at a negative angle so that a downward force (S) is generated, Fig. 6. This balances the nosing down moment. The wing setting is changed in low wings and flying boats because of this consideration of balance.

The difference in angle between wing and stabilizer should be approximately 2-1/2°. The negative setting of the stabilizer in such planes should be approximately minus 2-1/2°. Therefore, to create this difference the wing must be set at zero degrees to thrust line as shown. The less negative the wing and stabilizer are set, the more nosing up tendency there will be during glide for any climbing flight adjustment. Because of this effect, this arrangement makes an excellent setup for speed planes where the nosing up effect is desired immediately after the motor cuts out, in order to prevent a nose dive and a high speed crash landing.

All the forces discussed so far deal with longitudinal stability and flight attitudes. However, when an airplane turns it can be spirally stable or unstable. This condition is controlled by the CLA; when placed as shown in Fig. 7 below a line through C.G. that is parallel to thrust line,

(*Turn to page 63*)

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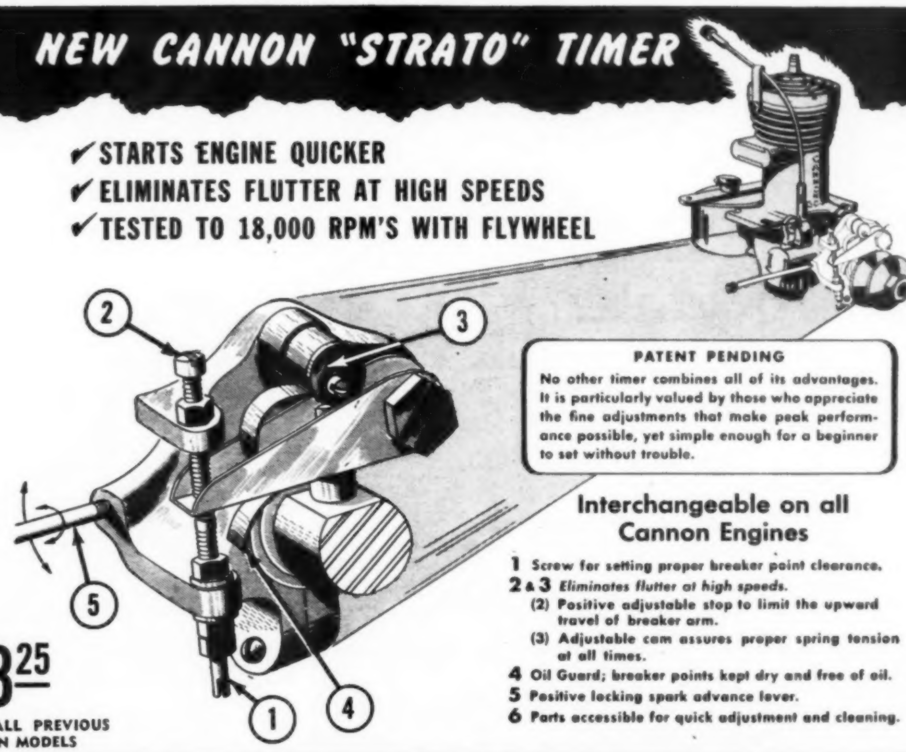

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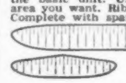

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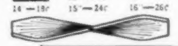

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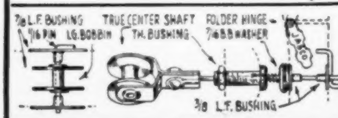

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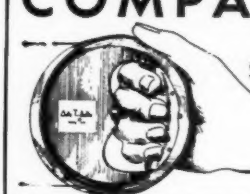

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it will have little tendency to bank; and if it banks it will start to roll about axis (DD) and continue after the roll is initiated about axis (RR). Because these are slanted upward the plane will roll with the nose up and will therefore climb instead of dive. The CLA is taken to be the point of side pressure reaction.

Theoretically there is no such thing as side pressure when an airplane turns because it is supposed to turn and roll in such manner that its longitudinal axis is always parallel to the line of flight or tangent to the flight circle. However, in actual practice airplanes seldom, if ever, react in this manner because they are continually being disturbed by wind gusts and are being thrown or turned sideways about any one of its axes by the torque reaction of the propeller. Thus we must consider this side pressure because it actually exists when airplanes turn.

To determine precisely the point of reaction is impractical because this point moves and is located at various positions with varying angles of approach of the side gusts or side airflow. However, there is one average point which empirical tests show will give correct answers to calculations and which will give practical results in all cases.

The side projection or outline of the airplane is drawn as in Fig. 7. Half the propeller side area is included because half the time the propeller is vertical and half the time it is horizontal. There are two elevations to the wings, each wing tip being raised above the center. Hence there are two vertical projections producing reactions. If two wheels and landing gear struts are used, this also will produce double the effect of one projection, so the parts which have double effect are cross-hatched, Fig. 7. Now cut out a cardboard patterned to the outline of your drawing, pasting a double thickness of cardboard over that part of the pattern which is cross-hatched; balance resultant pattern on the point of a pin. Move the point of support until the pattern balances perfectly. This point is then the center of lateral area (CLA). The rolling axis (DD) about which the airplane rolls due to torque or wind gust passes through the C.G. and the CLA because these are the two points of reaction to any such rolling forces.

However, after the plane starts to turn due to action of banking or torque, centrifugal force due to the plane's weight reacts outward at C.G. Any side pressure due to this tendency to skid outward reacts at CLA for the whole airplane; or in other words, at point (F) for the forward part and point (B) for the rear part, (F) and (B) being the centers of area of the forward and rear half of the airplane respectively, the division taking place along a vertical line through CLA. So the C.G. pressing outward and side forces pressing inward at (F) and (B) will neutralize each other and in the case of Fig. 7 will cause only a slight banking tendency because C.G. is approximately on the axis (RR) through (F) and (B).

If it is far below this axis the roll tendency about (RR) will be great.

If you apply these features to your future models it will pay you dividends in improved flights; and particularly do we hope that this analysis answers the questions of Master Sergeant H. V. Sherman, Val Rich, Charles Cohen, J. Richard Brett, Jack Zipperian and many others who have shown interest in the performance of their models.

Don't forget to send your problems and designs for models and full scale craft to "Design Forum" for discussion.

. . . More on Helicopters

(*Continued from page* 40)

"floating." Sometimes, depending on the size of the rotor, static balance weights ahead of each blade will give a smoother performance.

The rotor head of the model with tail prop illustrated herewith is an attempt to secure fully automatic cycling. This model is flown forward by adding a small weight to the nose, the angle of the blades on each side of the rotor being controlled by air pressure on them. This method shows promise, although the writer has had only indifferent success with it to date. The crux of the matter seems to be obtaining the proper static balance.

Now the question is sure to be raised: "Is it possible to obtain forward flight in machines of this type without using cyclic pitch?" The answer is "Yes," but in a rather weak voice. If the rotor speed is high enough and the forward speed of the machine slow enough, a fairly decent horizontal flight can be obtained—but the rotor must be highly articulated. If the speed increases above a certain critical point, however, the model will tilt and begin to fly sideways at the same time, which condition will soon resolve itself into the helicopter's equivalent of a nose dive.

Several methods of transmitting power to the torque prop are shown in Fig. 6. "A" is the common sandpaper-faced pulley and string belt arrangement, "B" is the flexible shaft drive which uses aluminum and neoprene tubing and a friction roller at the rotor head; and "C" is the wind-up, wind-down string and spool system in which the string winds both ways at once and rewinds itself automatically as the main rotor is turned. In any case the blades of the torque prop should be adjustable.

In dealing with the problems of control of co-axial model helicopters we find there are several methods that give good results. Because there are two rotors turning in opposite directions in co-axial machines, it is possible to make these fly forward by adding weight to the nose or by shifting the angle of the rotor axis. In models there are two good methods of obtaining forward flight by CG shift: the simplest is to add weights to a hook in the nose. This works well on experimental machines and is very convenient. A model using this method should be slightly tail heavy without weights making it possible to obtain reverse, vertical and forward flight by flying with or without various small weights.

A slightly more complicated method is shown in Fig. 7. With this setup the motor tube is moved fore and aft along an arc by means of a movable guide plate and pivoted thrust bearing. A friction holder is required on the movable plate to prevent shifting in flight. When laying out a model of this type, be sure to allow ample clearance for the rotors at both extremes of movement so they won't hit fuselage or tail surfaces.

Slipstream controls may be used to turn the nose of the model right or left (or correct turning tendencies), secure forward flight, or may be used in conjunction with CG shift to obtain extremely accurate trim. Several types of slipstream controls are shown in Fig. 8. Control surfaces of this type on a helicopter differ in function from that of a conventional plane, and it is important that this difference be understood.

In a conventional plane, control surfaces are used to set up or arrest turning moments around one or several axes.

(Flaps and slots are no exception; neither are they true controls.) In the helicopter, only one control surface effects a turning moment, that is the heading surface which points the machine in the desired direction. The other surfaces are not as much control surfaces as they are secondary propelling surfaces and act by reaction to direct slipstream in a direction opposite to that in which forward motion is desired. This is the function of the "elevator" shown in Fig. 8, as should be quite clear from the drawing.

It must be noted that the resistance of these control surfaces at a distance from the rotor axis has a tendency to produce a condition similar to that of CG shift, and this effect must be taken into consideration when designing this type of model.

A question, not covered exhaustively in the previous article, is that of "coning angle." Coning angle is the helicopter's dihedral angle. It is the angle of "dish," positive or negative, of a spinning rotor. From the writer's experience it seems difficult to lay down any hard and fast rule regarding it. Apparently it is wise to use positive cone on single rotor and dual rotor machines. With co-axial machines negative cone seems to give the best forward flight characteristics. At any rate either one appears to be better than a perfectly flat disk, and the writer suggests that builders try both and decide for themselves. Much can be said in favor of either.

Sometimes, after carefully designing and building a helicopter of his own design, the experimenter finds that despite all his efforts the machine will not perform as intended. What is wrong?

First, check the model for gyro effect. The procedure is relative in nature and must be learned but is not difficult. Wind up the rotors and hold the machine nose down. Releasing the rotors but not the fuselage, move the machine around in various directions about its longitudinal axis. If there is considerable resistance to such movements, the chances are that the blades are gyroscoping. This calls for more sandpapering to add flexibility or easing up of the articulation system if the rotor is of that type.

If the machine rises but shows a tendency to oscillate, the trouble may be caused by an unintentional pitch differential between two or more blades of the same rotor. Check the pitch carefully, using a template to insure uniformity.

Plain and simple wobbling is usually caused by unbalanced blades or uneven tracking. Another type of wobble difficult to correct is caused by "puffs" of air striking the top of the fuselage aft of the rotor axis and ahead of it at different times. This effect is most often noticed in machines employing a three-blade rotor. For this reason the writer recommends that rotors having two or four blades be used. This may sound like a small thing, but in helicopters it is often the small things that count.

The helicopter experimenter should never take it for granted that something which is good practice in airplanes will work equally well on rotary wing craft. Usually it will not. However, if there is ever any theoretical doubt as to whether or not a thing will work, *try it!* Some of the most important inventions have been accidental discoveries. Such discoveries are the rewards of providence to an inquiring mind—and certainly nothing to be ashamed of.

Good luck!

Sparrow Glider

(*Continued from page* 35)

it on straight and at zero incidence. The small packing block at center rib leading edge assures proper setting. Add tail-plane support struts and piano wire tail skid. Make wing struts and paper and dope them.

COVERING—Bottom surface of each wing panel should be covered in one piece so as to get a good job of tightening with water. This does not hold true with the top surface which should be covered from root to rib No. 6 first, then covered with a separate piece of paper from rib No. 6 to the tip. This gives a beautiful wing with no wrinkles to mar it.

All flying surfaces can now be water-shrunk and a coat of clear dope added. On the real *Sparrow* all parts covered with plywood were painted orange and all fabric green. Your author's model was covered in the same manner. All sheet balsa parts were doped orange and the remainder of the glider was finished in dark green.

Your model will require some lead ballast before it can be expected to fly. This should be secured within the fuselage with glue between Former 1 and the nose of the ship. If you care to do so you can build a special little ballast box and glue it in with the proper amount of lead determined by testing the model and adding just a little at a time until the stall in the glide just disappears. The *Sparrow* flies slowest and turns in a hovering performance only when carefully trimmed in this manner.

Good luck! Build one and, like our friends across the Atlantic, do a "bit of slope soaring." If you are strictly a contest fiend, hollow the wing ribs and select the right balsa for the right spots; but don't change the airfoil, fellas, it's tops. You may have a winner!

Wind That Rubber

(*Continued from page* 21)

stipulate it can not weigh less than 8 oz. for not more than 200 sq. in. of wing area. English designers may for streamlining purposes put 6 oz. of weight into the structure of the model and use only 2 oz. of rubber. American designers would probably build a 4 oz. simple box type model and use 4 oz. of rubber of many strands to provide the "oomph" needed to get the model up into thermal territory in a jiffy. In still air however, with no thermals, the English model would more than likely beat a typical American design because of its longer motor run.

We hope by now you are convinced that winding and flying outdoor models is strictly not kid stuff, but requires brain work along with that strong arm. But as final proof, take an average outdoor model that is powered by a motor made up of 20 strands of 1/4" flat rubber 40" long. Buddy, when you are at the winder end of this hunk of rubber "strand" trying to get in those few last turns you feel like you are trying to turn over the crankshaft of a Twin-Row Wright Cyclone instead of a hand drill winder. It has the feeling of a powerful tightly coiled spring, and just when you say to yourself, "One more turn"—wham, no more model!

It is just about impossible to wind the average outdoor model with the "egg-beater" winder mentioned by so many writers. The eggbeater winder (in the old days of twin pushers an eggbeater could be converted into a winder by cutting off the mixing ends and soldering on hooks

(*Turn to page* 68)

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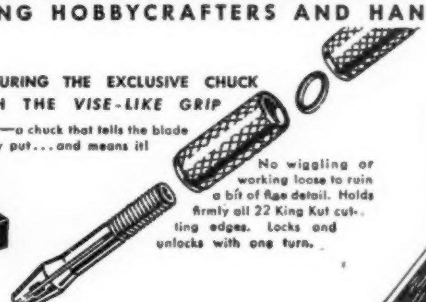

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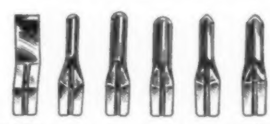

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for the rubber "S" hook attachment) can still be used on very lightly powered jobs —not more than 6 strands of 1/8" rubber. Even the ordinary hand-drill with the chuck removed and a hook soldered at the end of the shaft, while strong enough for winding smaller models is still not powerful enough for the really high-powered jobs flown by the champs. The handle is too small to grasp strongly and the radius of the main gear too small for easy turning against the force of a large rubber motor.

To do an efficient job of winding these dynamite packed super powerful motors requires a really man-sized winder. The best winder we ever saw was converted from a large "waist drill". It is large enough to handle the most powerful motor. Don't swipe your Dad's, but get together with the club and make one of these winders for the use of everyone. Remove the chuck and drill a hole through the shaft, solder on a hefty piano wire hook (bind the hook to the shaft with fine copper wire before soldering). There's a good reason for removing the chuck, drilling a hole through the shaft and soldering on the hook; many times if this procedure is not followed and the chuck is left on it loosens up during winding. The mental picture of the fellow holding the model receiving a large chuck at the end of a fully wound motor in the stomach is not pretty to imagine. (This has actually happened.)

Our advice to anyone who doesn't know how to wind is to practice breaking a couple of motors against the doorknob instead of inside a new model. There's a good reason for this. Besides saving wear and tear on the model, you get a better idea of how many turns can be put in the motor and you are not handicapped by the mental hazard of having the model in front of you. This is the best way of getting the feel of winding and it can't possibly damage the doorknob.

Regardless of how large a motor you are winding, always stretch the rubber out as far as you possibly can before beginning to wind. Don't be afraid of its breaking; good brown contest rubber should be stretched out at least five times the length of the original loop before beginning to wind. Now pack in at least half the total turns you intend to put in the motor. When half the turns are in, (always count the turns mentally to yourself while winding) start coming in towards the model, gauging the balance of the turns by the rubber's tautness. After practicing awhile you actually develop a feel of the rubber and know how "tight" it is, and just how many more turns can safely be added.

Rubber should always be used lubricated and never wound dry because the friction of winding causes nicks in the strands and almost certain breakage. Furthermore, lubrication increases the number of winds that the motor will take. The best lubricant we know of can easily be prepared by mixing one part glycerine with two parts liquid green soap. (Ask your local druggist). Apply to the motor by pouring a few drops into the palm of your hand and carefully work into the strands. Make sure all strands are well lubricated, but not excessively so as the unwinding motor inside the model will spatter lubricant all around the inside of the fuselage. Don't lubricate knots as they will most certainly untie under the tension of winding. A lubricated knot is also most difficult to retie, but it can be done in an emergency by licking off the lubricant around the tieing area and then

(Turn to page 70)

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retying. (P.S. Always use square knots.)

Here's how the expert contest flyers operate: The night before a contest they always make up motors for the next day and, because their models are always well tested before a contest, they know how much power each model uses and how many strands of what size rubber are needed. The motors are lubricated and prewound so that during the contest all necessary work has been done and he has more time for flying. You will always notice that the expert does not leave extra motors lying around in the dirt and sun but keeps them carefully wrapped in a cloth and in a shady spot until actually needed for an official flight. *Dirt causes nicks, and sunlight weakens the rubber.* Some boys even keep their motors in thermos jugs until ready for use. After a contest motors are carefully washed in warm soapy water and when dry, dusted with talc powder, then placed in an airtight container and kept in a cool dark section of the house.

What type of rubber to use? Years ago the only rubber available was black in color; but today several different types are available. In 1933 the original T-56 contest brown rubber was developed exclusively for use on models and was far superior to the standard black variety. This T-56 rubber quickly captured all National records and soon was used by all expert contest flyers. During the war it was impossible to use pure para rubber from which T-56 is compounded so it was not until recently that this championship rubber once again became available to rubber fans. Synthetic types that were used as substitutes in the war years do not have the power of T-56, and though they are not affected by sunlight they are not recommended for contest flying.

Nicks started because of dirt and grit are the chief reason for breakage of most motors, hence, as mentioned previously, extreme care should be taken to make certain that motors are not allowed to fall on the ground. Nicks however can also be started by sharp edges on prop shaft and rear hooks. To prevent this, slide heavy rubber tubing over prop hooks and rear hooks. If a dowel is used in place of a rear hook use rubber tubing on this also. Bobbins, sold by leading model dealers, are also good to use as they not only prevent the rubber from nicking but stop the pet habit that fully wound rubber has of trying to knot up around the prop shaft.

The turns chart included with this article shows how many winds can safely be put into a motor using T-56 rubber. When practicing winding use this chart as a guide and try to see how close you can come to winding in the maximum number of turns. After you have gotten the feel of winding you are ready to go out and battle with the experts. But don't ever forget those famous last words: "It will stand a few more turns!!"

All Balsa Folding Props

(*Continued from page* 41)

on hand, small round-nosed pliers to bend the wire. Materials: 8 in. of 1/4" square balsa, and a piece of 1/8" sheet 2" x 12". This will provide enough material to make two props—the one illustrated, and one you can tailor to your own needs. Don't forget several beads, spangles or sequins to be used for bearings. Metal washers may be used, but they are heavy. Plastic beads are lighter than glass ones, and if you can't get sequins or spangles, punch a hole in several small circular pieces of celluloid. An old photo negative is handy here.

Now for the actual construction. Cut a piece of 1/4" square 2-1/4" long and lay it on a piece of 1/8" sheet 1/2" wide. Cut two pieces of 1/8" x 1/4" x 1-5/8" and cement them edgewise to the base, using the 1/4" square as a spacer. When dry, remove the 1/4" square and trim away the excess from the base. The trough shaped piece resulting is the hub, with the 1/8" sheet forming the rear face (see sketch A). A reinforcement is now added to the hub by marking the center of the hub and cutting a slot 1/16" and 1/8" wide in the forward edge of the sides of the hub. A 1/16" x 1/8" piece is cemented in this, and the excess trimmed from the sides.

Before going any further it is best to drill or burn a hole through the rear face of the hub, and through the crossbrace make certain the holes are in line and are perpendicular to the sides. This accommodates the wire prop hook, which may now be inserted through, first, the nose plug, then the bearings, next the base of the hub, and finally the crossbrace. Form a loop to receive a winder, then bend the wire back into one of the sides of the hub at the crossbrace and cement in place.

The 1/4" square piece is now sanded so it will fit freely but not loosely in the trough of the hub. Mark the forward face (one which is not sanded) so it can be identified, and cut the piece in half. Each of these 1-1/8" pieces will form a shaft for holding a propeller blade.

Place the 1-1/8" lengths of 1/4" square in the hub at either side of the crossbrace, keeping them 1/8" away from it. Holding them firmly in place, drill holes for the

(*Turn to page* 72)

pivots, which are small rods of balsa sanded round. The holes are drilled or burnt with a wire 5/8" from center of the hub, and are drilled through the hub sides and the shafts at the same time. The shafts are then removed and the pivot holes filed out with the rat-tailed file until the pivots revolve freely in them. The pivot holes appearing in the hub sides should hold the pivots tightly. Replace the shafts in the hub and insert the pivots through both. The pivots are trimmed flush, and a drop of cement on either side holds them in place.

Now cut away just enough of the hub base to allow the shafts to rotate 90 degrees.

The reader's pet theories as to the shape and pitch of the blades may now be brought into play. However, the blade illustrated will be found to work well. A template of heavy card is cut to the desired shape; using it, make two blades from 1/8" sheet. They are sanded to an airfoil shape, the concave rear being made by holding the sandpaper wrapped around a finger. Enough of the blade must be left square during the sanding to insure fitting in the shaft. Now file slots in the shafts, at 45 degrees, diagonally across the outside end of the 1/4" square shaft. In case a flat file is not available, a substitute which works as well if not better can be made by glueing a 1/8" wide strip of sandpaper to the edge of a piece of 1/8" sheet. To insure cutting the slots accurately, use a jig which holds the shaft at the proper angle, meanwhile sliding the file across a support built up to the proper height, cutting into the shaft 1/2" deep, which will bring the slots to within 1/16" of the hub itself.

Now fit the blades into the slots and glue them in place, making sure they are in line by laying them over a paper pattern.

Dunk both blades in boiling water, keeping the hub dry, and bend blades to a helical shape, the base of the blade remaining at the 45 degree angle and the tips set at 20 degrees. A little attention while the blades are drying will insure their being the proper shape when dry.

The final operation consists of shaping the parts with knife and sandpaper, taking off excess balsa which does not function. The final shape is shown in the illustrations. The blades may be doped if desired, but neither dope nor oil the hub or shafts.

Now you are ready for actual operation. Flights are made in the conventional manner. Here's a tip: the red, synthetic rubber that is not too well liked for contest work is ideal for use in conjunction with a folding prop because it will whirl the prop at high speed and then stop dead, rather than slow down gradually as does the more flexible natural rubber. One word of caution: keep the propeller out of the dewy grass, as the shafts may swell enough when moist to stick in the hub, preventing folding; therein lies the only bug inherent in the all-balsa folding propeller. It can, however, easily be avoided.

The lightest of all folding props, one which will work on a microfilm job, is constructed in the same manner, the only difference being in size and in dimension of the materials used. For the hub and sides use 1/16" sheet; for the crossbrace use 1/16" square. The shafts are 1/8" square, and the blades are made of 1/32" sheet, sanded to paper thinness. The dimensions of the blade are of course tailored to fit the plane.

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Nationals Scale Winner

(*Continued from page* 17)

full size templates.

Pin the longerons of 1/8" sq. hard balsa on the side view and fit uprights and diagonals of 1/8" sq. soft balsa. Build both sides together, one atop the other to get them exactly alike. Separate the sides and join them with crosspieces at the nose and at the last diagonal. Pull the tail end together and install remaining crosspieces. Cement the fuselage top formers in place and insert the stringers of 1/16"x 1/8" medium balsa. Assemble the fuselage bottom fairing in similar fashion. Cement front former F 1 in place and cut away the central portion of the front crosspiece to provide clearance for the rubber, then cover the nose with 1/16" soft sheet balsa for reinforcement. Add the fuselage side stringers of 1/16"x1/8" medium balsa and the "beads" of 1/16" sq. soft balsa. Give the cabin its distinctive outward slope with formers F 21 to F 25.

Fit the landing gear bulkhead F 19 in the fuselage. Form the landing gear of 1/16" piano wire and cement it to the bulkhead, locating it with filler pieces of 1/16" sheet. Apply several coats of cement to this assembly and cover the face with a gusset of 1/16" sheet, cut to the shape of F 19. Fair the landing gear struts with a soft balsa fillet at the fuselage and a hard balsa streamlined section to the axles. Carve a tail cone of soft balsa, hollowed to 1/16" thickness and cement it to the fuselage tail. Reinforce the area around the dowel rubber peg with 1/16" sheet, and add the fin base F 20.

Glue up the nosing, using soft balsa. Shape the block to approximate section with knife and rough sandpaper, then cement it to the fuselage and blend the lines smoothly into the fuselage front. Cut the face of the nose plug from 3/8" sheet to the contour of F 27, and cement a piece of the same stock, 15/16" x 1-1/8" to the rear. Fill in the sides of the opening in the nosing with 1/4" x 3/8" to receive the nose plug snugly. Drill a 3/32" hole for the prop shaft, providing approximately 1 degree downthrust and 3 right thrust.

Carve the propeller from a medium hard balsa block 1-3/8" x 1-3/4" x 10-3/4", shaping the blades carefully and undercambering the back face about 1/8" at the widest section. Finish with fine sandpaper and apply several coats of clear dope. Hang the brass hub straps of .032 material on the hinge pins formed of .040 wire. Cement these assemblies to the propeller, tilting the hinge axis to permit blades to fold as cleanly as possible against the nose. Cut the blades free and check their action, readjusting the angle of the hinge axis if necessary. Apply several heavy coats of cement to the fittings to anchor them securely.

Install bearings formed of .032 brass on the back of the prop and on the front of the nose plug. Form a 3/16" diam. winding eye in the 1/16" piano wire shaft and push the shaft through the prop, cementing the spur into the hub. Assemble the spring and washers on the shaft, push it through the nose plug and add the combination stop and rear bearing. Form the rubber hook, providing a generous spur to engage the stop. Set the nose plug in place and fold back the blades to determine correct position of the stop. Cement the stop securely in place to assure the propeller folding in the same position during every flight.

Shape the trailing edge to a triangular

(*Turn to page* 76)


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section and pin it to the wing plan. Cut the wing ribs of 1/16" soft balsa. Set ribs 3, 8, and 12 in place and pin the leading edge of 1/8" x 3/16" against them and install the intermediate ribs. Add the wing tips, assembled of three sections of 1/8" sheet. Cement the upper spars of 3/32" sq. hard balsa in the notches in the ribs. Remove the wing panels from the plan and add the lower spars.

Cement the 1/16" sheet centersection gussets W 11 and W 12 to the spars of one panel. Block up the wingtips to the required dihedral of 2-5/8" and cement the gussets to the spars of the other panel, taking care to prevent a warped wing assembly by holding the parts securely while drying. Add the remaining ribs, trimming them as necessary to fit around the gussets. Cover the leading edge with 1/32" sheet balsa. Build up the cabin fairing of 1/16" x 1/8" strips.

Assemble the simple tail surfaces directly on the plan. Pin the stabilizer trailing edge in place, locate the tip and center ribs, and pin the leading edge against them. Add the remaining ribs and the 1/16" sheet tips. Build the rudder and fin outline of 1/8" sheet balsa sections. The fin base rib and the spars are 3/32" x 1/4", while the ribs are 1/16" x 1/4". When dry remove the assembly from the plan and shape to a typical streamlined section. Hinge the rudder to the fin with scraps of .020" soft aluminum.

COVERING AND ASSEMBLY—Sandpaper the entire assembly thoroughly to remove any bumps that may mar the smooth lines of the finished job. The original ship was olive drab with gray underneath the wing, stabilizer and fuselage. Our ship however was covered with our favorite combination of dark blue fuselage and red surfaces. Colored tissue produces a lightweight and easy to maintain job. Attach the tissue with as little dope as possible, and avoid sticking to anything but the outlines. Spray the surfaces lightly with water and apply a couple of coats of dope when dry.

Shape the leading edge slats of 1/8" x 7/16" balsa and cement in place. Mount hooks formed of .010" wire or pins on the fuselage where shown to hold the wing and stabilizer attachment rubberbands. Cement the fin and rudder assembly to top of the fuselage. Check while drying to be sure it is vertical to the wing and tail, and parallel to the center line. Build up a fairing of 1/32" soft balsa on the stabilizer to match the bottom of the rudder. Shape the streamlined wing struts from 1/8" x 5/16" balsa. Cement them to the bases provided in the wing, bracing them with jury struts of 1/16" x 1/8" streamlined balsa. The struts are attached only to the wing, *not* to the fuselage. With this system the wings can be shifted for adjustment, removed for transportation, and subjected to greater punishment without damage.

Scale details can be made if desired from scraps of material available on every builder's bench. The front of the nose plug can be recessed and equipped with a dummy engine built up of wafers of .020" aluminum.

FLYING—The L 5 is powered with 10 strands of 1/4" flat brown rubber 24" long and well lubricated with a half and half mixture of green soap and glycerine. If 1/8" rubber is used 20 strands are required. If 3/16" rubber is used 16 strands 25" long are required.

Pull out the nose plug, wind the motor about 100 turns, then replace the plug and allow the prop to unwind until the stop engages, in order to take up the slack. Attach the wing and tail with small rub-

berbands. Check the ship for balance. Add weight to the nose if necessary, until the ship balances on the line indicated on the plans. Glide the model in a grassy field and adjust to a smooth descent. Slip a small shim under the stabilizer trailing edge if the angle is too steep, or under the front spar if the model stalls. Put about 150 turns in the rubber and hand launch. Try to perfect the glide, adjusting the rudder to fly the model in about 40' right circles. Increase the number of turns, controlling the circle under power by tilting the thrust line in the desired direction. Once tests have been made under full power with hand winding, the rubber can be stretched about four times its length and wound with a geared winder. Under the authority of 800 tightly packed winds, the L 5 will vault eagerly into the air and settle down in a thermal-conscious glide.

Air Ways

(*Continued from page* 31)

notes on the meet are, briefly:

1. Policing, both of spectators and entrants other than those actually flying, will be strict. Contestants entering a flying area, other than those actually making official flights or next to fly, will be disqualified.
2. There will be no practice circles or areas. Contestants will be expected to arrive prepared to *contest.*
3. Elaborate preparations for feeding both contestants and spectators have been made.
4. A tent city will be a certainty this year.
5. All free flight events will be ROG and engine runs will be limited to 15 sec.
6. The scale model event will be replaced by a beauty event and every prize-winning plane must be actually flown.
7. There will be only one full size plane airshow.
8. There will be no championship prize, but each event will be judged separately and the prizes will be spread much more widely over the various winners.

An event of this magnitude will be watched with the greatest interest, and the lessons learned are of importance to every contest director who aspires to stage a similar event.

* *

Picture No. 1 shows a canard pusher powered by an *Ohlsson 23* and built by W. L. DeGrinder, Medical College, University of Texas, Galveston during his Christmas holiday. This model was built as a natural result of modeler DeGrinder's experiments with canard design in gliders and whip-control. Flights have been encouraging, and he plans to build a C engine into a canard. He writes he is anxious to get his new designs off paper and into the air.

No. 2 pictures a versatile Fairchild 24 built by Chris B. Falconer, Box 234, Ste. Anne de Bellevue, Quebec, Canada. It is rubber powered but can be converted into a towline glider by replacing the prop with a weighted spinner and nose plug. There is a set of two hooks under the engine cowl. This ship is also rigged up for installation of a Univex camera within the cabin, a removable door being placed between the landing gear legs for unobscured vision below. The camera may be adjusted at various angles for downward view, and the camera trigger is operated by a *Hurricane* timer. Chris

writes that this model compares favorably with contest ships in flying performance.

H. C. Hilburn, 2606 Darien Street, Shreveport 35, La. contributed No. 3 showing his modified *DeLuxe* built from plans featured in Nov. 1945 M.A.N. This model has a 50" wingspan, is powered with an *Ohlsson 60*, and the fuselage is balsa covered. Modeler Hilburn first covered the wings with 1/16" balsa, but after finding the plane a bit heavy he refinished them with Silkspan.

No. 4 shows a glider built by Naftali Lemke, 64, Stampfer Rd., Petah Tiqva, Palestine, who is secretary of the *Jewish Aero Circle*. This circle was established three years ago and its members have been showing consistent progress under the leadership of Dr. Sultan. To their own surprise they managed to open an exhibition 14 months after formation, showing 30 finished models, many semi-finished parts, tables, etc. and a complete model workshop. They then proceeded from the building of sailplane models to real sailplane flying, and they report that they still find time to instruct younger boys in aeromodelling.

John W. Ahern, 1438 East 3d St., Brooklyn 30, N.Y. contributed No. 5 which shows the 1/4" scale B 25 which he started while in the Army and finished after his discharge. He writes that he hollowed out the fuselage and partitioned off a bomb bay with bomb racks, 8 built-up bombs and swinging bomb bay doors. The cockpit details include bucket-type seats, control wheels, rudder pedals and a pilot's control stand, instrument panel, and a fire extinguisher. The nose opens up revealing 4 dummy ammunition cans with belts leading from the cans to the machine guns. The turret was moulded from a piece of salvaged plexiglass and the gun openings cut into it. The turret rotates completely around on a turned down flanged washer which is secured in the fuselage, and the guns move up and down on a pin pivot through the gunsight inside the turret. The waist has a radio and radio operator's seat, and the waist guns are flexible in celluloid windows as are the tail guns, the tail also having a celluloid canopy. It has a shock absorbing landing gear which works, the shock absorbers being lock tumbler springs in the gear struts. All control surfaces are movable. This model was finished with 6 coats of silver dope and about as many coats of wood filler, clear dope, Plastico Rok, etc., each coat being sanded smooth before the next was applied. John reports that the only things he bought for the plane were the propellers, the dummy radial engines, and the machine guns.

No. 6 was submitted by Don Holmes, 324 Riley Road, Muncie, Ind. To a *Zipper A* he added a flat 6" section in the center of the wing, a 2" section in the stab, and lengthened the fuselage 2". This model is powered by an *Atom* which is on a lowered thrust line. Don is also responsible for the photography, having taken this picture with a 35 mm. camera and floodlights.

No. 7, by Kenneth Maxwell, 353-1/2 Central Ave., Fillmore, Calif. shows his solid scale model of the Vought FG-1 *Corsair* flown in the 1946 Bendix Race, but for which he failed to send us any construction details.

Hans Justus Meier, 23 Bremen, Kirchweg 33, U. S. Enclave, Germany, submitted No. 8 of his first postwar model glider. This model was built to learn about the utility of a very thin airfoil (5% thickness) highly cambered, which

(*Turn to page* 80)

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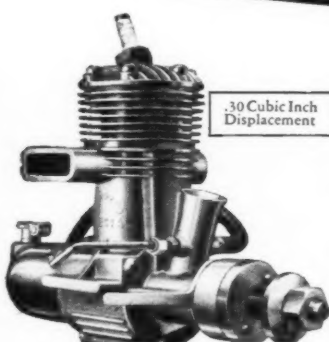

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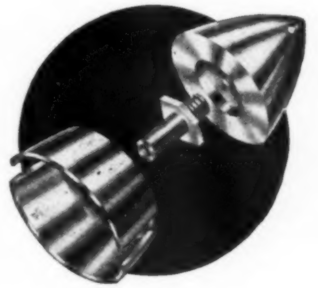

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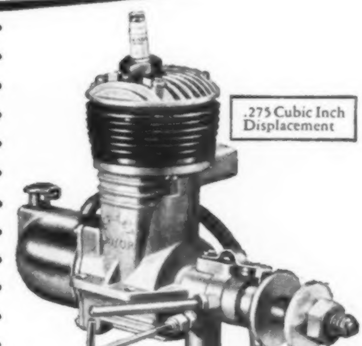

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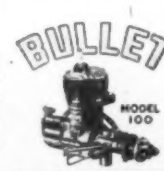

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Prof. Alexander Lippisch has recommended for fast flying models. The model boasts a very high wing loading (weight 10 oz., wing area 154 sq. inches, span 31-1/2", length 28", elevator area 1/3 of main plane area) and consequently is a very fast flyer. The ship flies well and can easily be tow launched, but the thin wing section was found to be a bit unstable. The model was suspended for the photograph because the contributor did not have a camera which was fast enough to catch this glider in flight.

No. 9 shows the record breaking speed model built by L. S. Cook, 320 Hayden Street, Healdsburg, Calif. He writes he was able to attain a speed of 128.52 mph with this model on January 26, and he is consistently able to achieve 112-115 mph with the hand-carved prop shown.

Paul I. Brown, P. O. Box 2188, Norman, Okla. submitted No. 10 which shows a scale model Westland *Whirlwind* built in only two weeks by Bill Cates and Clarence Nigh, members of *Flying Sooners Model Club* of which Paul is president. This model has a 46" wingspan, weighs over 4 lbs., and is powered by two *Forster 29's*. The *Whirlwind* will fly well on either engine after it is in the air. It has several outstanding features including engine control, retractable landing gears, and a tensiometer rudder control which holds constant pull on the lines under all flight conditions, even when only the outside engine is operating. The model has a top speed of 65 mph and has gas tanks large enough for ten-minute flights.

No. 11, by J. W. Jacoby, 2444 Hilgard Ave., Berkeley 9, Calif. shows a *Challenger,* powered by an *Ohlsson 19,* built by Jim Elliott who lost it in a thermal shortly afterward. We received no construction details with this photograph.

F/Lt. D. Robertson, RAF, 15 Whitworth Road, London S.E. 25, England submitted No. 12 which shows the Wakefield model he built in England, covered in South Africa, and which finally cracked up back in England. F/Lt. Robertson did not provide any constructional details.

NEWS OF MODELERS

Mac Taylor, 1222 Linwood Ave., Norristown, Pa. would like to start a correspondence with a foreign model builder or one in the U. S. who has had experience with free flight gas planes and who would like to exchange plans, magazines, kits and ideas.

We received a letter from L. G. Temple of England, addressed to Jon Hauser who once wrote an article for M.A.N. about building scale models. Since we do not have Mr. Hauser's present address, we take this means of asking him to contact our editorial offices for Mr. Temple's letter.

G. Coston, N.G.A., 159, Coulsdon Road, Caterham, Surrey, England writes to us as Secy. of *Caterham Model Flying Club.* He contends that the R.O.W. models in the Nationals did not compare favorably with the English R.O.W. models which were designed to R.O.W. and land on dry ground. He writes that our diesel engines are far behind theirs, but that our gas engines are years ahead of the contemporary English models in both design and performance. He also envies American modelers their availability of materials and their comparative cheapness, also the marvelous trophies they are able to win.

M. Pierre Le Brun, A Payns, Aube, France writes that he has been building models for 10 years and would like to correspond with an American modeler and exchange a French diesel engine for

(*Turn to page 82*)

Next M.A.N. PLANE ON THE COVER!

The June cover of MODEL AIRPLANE NEWS will feature the *Olympia* glider—a design that was smuggled out of Germany during the war and recently was completed here . . . This ship should be a natural to copy as a towline glider!

modeling supplies which he cannot buy in France.

In our April issue we printed a photograph in the Airways Department of a Rearwin *Speedster* submitted by D. F. Galasneau, Portland, Ore. who is therefore entitled to a year's subscription. Since the Post Office will not accept this address, we ask Mr. Galasneau to give us a more complete address.

CLUB NEWS

California

Because model airplane flying was forbidden in Balboa Park, the January 18 contest of the San Francisco Recreation Dept. was held in the old victory garden behind the Junior Museum with the following results:

Junior Division—1. Eddie May; 2. Larry Giordanengo; 3. Noel de Nevers.

Micro Division—1. Frank Pagano; 2. Jack Ritner; 3. Bill Oppenlander.

The San Diego Aeroneers held free flight contests last December 29 and January 26 with the following results as reported by Harold W. Thomas, Publicity Director:

December 29

Class A—1. Bob Glines; 2. Ernest Wrisley; 3. Bud Hack.

Class B—1. Edd Green; 2. J. Squires; 3. P. Pavlow.

Class C—1. Whitey Glines; 2. Doug Merrill; 3. Gene Ryan.

January 26

Class A—1. Ernie Wrisley; 2. Bob Glines; 3. Ernie Wrisley.

Class B—1. E. J. Brown; 2. Bill Trumble; 3. Denny Davis.

Class C—1. Gene Ryan; 2. Doug Merrill; 3. Alfie Faulkner.

The Annual Southwestern Championship Contest will be held April 27 and will again be sponsored by the San Diego *Journal*.

From June and Jack Dyer's *Aeroneer* comes news of a large dinner meeting held January 30 in Oakland in honor of Tom Herbert, Jr. of White Plains, N.Y. Mr. Herbert is the challenger of the East-West proposed championship. Roy Mayes, secy. of Aero Modelers Assoc. of No. Calif., arranged the meeting and invited club representatives and active workers in the Association.

East Bay Aeroneer Association results of the contest held January 12 R.O.W. are listed below:

Class A—1. Jack Dyer.
Class B—1. Don Foote; 2. Bill Steese.
Class C—1. Charles Hubbard; 2. Russ Watkins.

Election of following E.B.A.A. officers was held January 27: Pres., Bill Steese; Vice Pres., Squire Openshaw; Sec.-Treas., Alfred Kennedy; Sgt. at Arms, Jack Jacoby. Executive board consists of officers, and Jim Leibee and C. Doane. Squire Openshaw is Contest Director.

The *Peninsula Prop Twisters* held their contest at San Mateo ball park on January 12 with the following results:

Class A—1. W. S. Biscay; 2. Mel Anderson; 3. Royce Van Bebber.

Class B—1. Bill Thunberg; 2. Roy Mayes; 3. J. Gillespie.

Class C—1. J. Swensen; 2. J. Pedracci; 3. W. Dunkum.

Novelty (only entrants were teams)—1. Robert Heise and J. Swensen; 2. Don Vis, Ted Wilson and Eddie Bunley; 3. Bob White, Royce Van Bebber and Howard Puckett.

Results of the *Lakewood Model Assoc.* first Annual Rubber and Glider Contest held Feb. 2 were:

H.L. Glider—1. Don Donahue; 2. L. Slobad; 3. Bob Holland.

Towline Glider—1. Ray Pohlman; 2. Robert O'Brien; 3. R. C. Smith.

Outdoor Rubber—1. Bill Tharp; 2. Bob Holland; 3. Allen Trainor.

The *Fresno Gas Model Airplane Club* lists these results of their U-Control Contest held Jan. 26:

Class A Speed—1. Mal Anderson; 2. J. R. Jackson; 3. Gilbert Henderson.

Class B Speed—1. Mack Jurisich; 2. Carl Neilsen; 3. Lloyd Perisich.
Class C Speed—1. C. W. Mathews; 2. Mack Jurisich; 3. Vester Warner.
Precision Event—1. J. J. Swenson; 2. John Tavlian; 3. Jack Tiftick.

Just as we go to press we hear that the 1947 Western Open will be held in Los Angeles on June 28-30 and will serve as the regional eliminations for the 1947 Nationals.

The *Northrop News* tells the story of Howie Thompson, a Peoria boy who was president of *Peoria Air Screws Model Club* and who designed a winning model airplane before he lost his life in the Battle of the Bulge. Howie's friend and fellow club member, Robert O'Brien, who is an engineering student at Northrop Aeronautical Institute, brought the model with him when he came west to the Institute and won the grand championship of the Los Angeles area in December. With such a performance back of it, the plans for this airplane are to be released for commercial use, and from the earnings of this venture a suitable memorial will be erected in honor of its designer by Howie's model club.

Connecticut

On Feb. 1, Connecticut AMA license holders held their first convention in Hartford. Representatives took copies of the proposed rule changes back to their clubs to give the latter an opportunity to express their opinions. The results of these deliberations will be forwarded to Contest Board Member from Connecticut, Frank B. Bushey, who will assemble all viewpoints into a coordinated expression from the state. Club representatives elected a temporary board to draw up the final constitution, present it to all AMA license holders in the state, and to hold an official election of officers by April 1. This board consists of Dave Hunt, *Model Aero Engineers* of Hartford; Bob Comer, *Branford Sky Wolves;* Bill Paulson, *Elm City Gas Bugs* of New Haven; Ed Davis, *Danbury Hat City Gas Club;* Earl Anderson, *Waterbury Society of Model Engineers;* Ed Avena, *New London Prop Busters;* Richard Monnich, *West Hartford Quaker Club;* Carl Hermes, *Bridgeport Aeronuts;* Jack Marquandt, *Manchester Sky Liners;* and Frank Bushey, New England Coordinator for AMA.

Florida

At Lake Worth, Carl Vogel-Donald Lee post, American Legion, recently was host to the *Palm Beach County Model Airplane Club.* Legionnaires sat for two hours while members of the club demonstrated an assortment of models and explained such terms as: free flight, control lines, towline glider, and hand launching. Appearing in the demonstrations and explanations were Club Pres. Harold Gauger; Vice Pres. Bill Best; Secy. Bill Wilson; Treas. Bobby Montgomery; and Fred Kerr, Joe Doss, Frank Swarenger and Charles Litschauer.

Sponsored by the Junior and Senior Chambers of Commerce, City of Sanford, the first Southeastern States Glider Contest was held at Sanford Municipal Airport on March first and second.

THANKS to the Hobby Mart, 309 N. Miami Ave., Miami 32, for sending us all the information on the National Model Plane Meet held in Miami Jan. 18-19. William Mather, Cleveland, won the Senior division and received the trophy awarded by Pan American Airways; Bill Tuttle, Miami, won the Herald's trophy in the Junior division; Glenn Kelley, Miami, won the stunts events and received a trophy from the Power-Plus Wet Cell Battery Co.; Charles Posta,

Cleveland, won the R. S. Evans trophy in the Open division; and August Jacob, Coral Gables, won the Florida Open Championship and received a round trip to New York from Universal Air Lines.

Illinois

From Aurora comes news of formation of a new club, *The Aurora Aeronuts*. The club will fly at Wheatland Airport, three miles southeast of Aurora, on grounds donated by Capt. Alden Congrave of the C.A.P. All modelers in Aurora and surrounding towns are welcome to join this club and should contact Secy. Larry L. Meck, 7 Fox Promenade, Aurora. Other officers are: Pres. Stanley Bernard; Vice Pres. Eddie Price, Harry Kelly and Bill Meck; Rec. Secy. David Mann; Gen. Field Mgr. Ray Armbrust; Asst. Field Mgr. Richard LaMagdeline; Treas. and Club Advisor Hart G. Betts.

THE ROTARY CLUBS of Williamson County, with James M. Bailie of Merrin as Chairman, will sponsor a Model Airplane Contest for both juniors and seniors living in the area of southern Illinois south of the M & O Railroad on June 29. There will be glider, rubber and gas model events.

FROM EDWARD L. BROWN, Vice Pres. *Torque Jockeys* of Urbana, comes news of their progress. Formed last spring, they held their first contest last June. They were beaten so thoroughly that the members became fighting mad and devoted the rest of the season to winning contests throughout the state. A list of victories includes: 1st, 2nd, 3rd, Class C Speed at Bloomington; 1st, 2nd, 3rd and 4th, Class C Speed at Rockford; 1st in High Point Pilot Event; 1st in High Point Airplane Event; 1st in Class C Speed; 1st in Class B Speed, and 1st in Combat Event; 2nd in Tu-Speed Event, and 3rd in the Stunt Event at the Model Industries Chicagoland Championships in August; 1st in Class C Speed and 3rd in Class D at the Tennessee Trophy Races; and 1st and 2nd in Class B and C Speed respectively in Decatur; 2nd in Peru, 1st in Peoria, and a 1st and two 2nds in Terre Haute. All this was accomplished by a new club in which only two members had done any control line flying previous to last summer.

Iowa

James Poulsen writes that he and Monte Fee of the *Melcher Model Manglers* attended their first meet last fall. Monte won 4th place in Class B and James won 3rd in Class A free flight.

THE DES MOINES MODEL-AIRS are getting their club underway again, and interest at their first few meetings indicates they will have a really "hot" group ready for spring and summer competition. Recently elected officers are: Pres. Paul Johnson; Vice Pres. Rodney Q. Selby; Secy.-Treas. B. C. (Bill) Baldwin. A U-Control Contest will be held in Des Moines April 6.

Kansas

The Second Annual Mid States Model Aeronautical Assn. Meeting was held Jan. 4-5 at Kansas City, Mo. with the following new officers elected: Pres. C. O. Wright; Vice Pres. O. L. Elbring; Sec.-Treas. Al J. Hummel. Al Hummel also submitted the following tentative listing of contest dates:

April 27—Kansas City, Mo.—Schreiber—Rubber and Glider.
May 11—Kansas City, Mo.—Schreiber—Control Line.
May 18—Mission, Kans.—Bob Amis—Rubber and Glider.

May 25—Kansas City, Mo.—Schreiber—A, B, C Gas.
May 30—Belleville, Ill.—Exchange Club.
May 30—Waterloo, Iowa.
June 6th and 7th—Salina, Kans.—Kiwanis and Boy Scout (D. W. Cowan)—All classes.
June 14-15—Kansas City—Dealers Assoc.—All classes.
June 22—Kansas City, Mo.—Sky Kings—Free Flight.
June 28-29—Wichita, Kans.—State Control Line—Hy-Flyers.
June 28-29—Webster Groves, Mo.—Air Scouts (Elbring).
July 4-5-6—Iowa—State Meet.
July 19-20—Omaha, Neb.—State Meet.
July 20—Kansas City, Mo.—Schreiber
July 26-27—Sedalia, Mo.—State Meet.
Aug. 2-3—Topeka and Alma, Kans.—State Indoor and Free Flight.
Aug. 3—St. Louis Modelers.
Week of 17th—Nationals.
Sept. 1—Belleville, Ill.—Exchange Club.
Sept. 6-7—Kansas City, Mo.—Schreiber—Free Flight and Control Line.

DOPE FUMES, official monthly publication of Wichita's East Side YMCA *Hy-Flyer* Clubs and the MSMAA, reports the following election for *Allison School Hy-Flyers:* Pres. Jimmy Reynolds; Vice Pres. Wayne Adams; Secy. Edward Galloway. *Dope Fumes* also reports results of the Hy-Flyer U-Control Contest held Feb. 2:

Class I—1. Don McHugh; 2. Duane Stone; 3. Jerry Shumaker.
Class II—1. Dean Zongker; 2. Bob Hardesty; 3. Frank Manley.

PLANE TIPS, official publication of *Wichita Planesmen*, announces a city contest to be held May 31 and June 1. The events will include: Free Flight Gas (A, B, and C); Rubber—Stick and Cabin; Hand Launched Glider; Tow Line Glider; Control Line Stunt; Control Line Classes 1, 2, 3, 4, 5, and 6; with junior, senior and open classifications in all events.

Maryland

From Frederick comes news of the formation of a new club, *Kilroy's Kiljoys.* Officers are: Pres. Don Stride; Vice Pres. Bill Miller; Secy.-Treas. Ann Miller. New members are welcome and should contact Karl W. Brust, 228 E. Church St., Frederick.

Michigan

The Lansing *Balsa Buzzards* held their semi-annual election at Lansing Y.M.C.A. on Jan. 28 and elected: William Werback, continuing as Pres.; Harold J. Bell, Vice Pres.; Keith W. Yager, Secy.; Jack Pfeifer, Treas.; L. Cecil Winters, Contest Director. Committee Chairmen elected were: Charles Ripley, Membership; Joe Nelson, Technical; Tim Leifheit, Prizes; Harold J. Bell, Publicity.

Missouri

Kansas City SKI-HI Model Airplane Club Regional Contest will be held April 13 at Northeast Jr. High, Kansas City, Mo. There will be six major events including stunt.

Nebraska

A State AMA contest will be held in Omaha on July 19-20. Oscar Olson Jr., 2122 No. 56th St., is Contest Director.

On January 31 the *Omaha Model Builders Council* was formed. This organization is composed of representatives of civic organizations and model clubs, and their purpose is to promote model activities in Omaha and vicinity.

New Jersey

Howard Bueschel, Publicity Chairman for *Queen City Flyers* of Plainfield, submitted the following new slate of officers: Pres. Bud Coon; Vice Pres. Fred Richardsen; Sec. Iggy Spingolia; Treas. Mike Venezia. This club is working on a project to have the Union County Park Commission construct control line circles in Cedar Brook Park or Green Brook Park.

THE LINDEN MODEL AIRCRAFT

CLUB has come through a trying war period with most members returned from service and again actively building and flying models. Indoor flying is most popular, and weekly meets are held in the TWA hangar at Newark Airport. There is also a considerable amount of outdoor flying whenever the weather permits although the club is now searching for a new flying field for both free fllight and U-control. Anyone knowing of a suitable field for club flying is requested to communicate with the club, Old City Hall, Linden. Club members invite any serious builders in this vicinity to attend their meetings which are held Friday evenings at the Old City Hall.

New York

The *Binghamton Aeros* Model Airplane Club has been reorganized and the members are now holding regular meetings at Johnson City Library every other Tuesday night. Officers for 1947 are: Pres. Sam Winterstein; Vice Pres. Don Allen; Secy. Herb Menish Jr.; Treas. Eddie Rowe.

THE FIRST MEETING of New York City *Metropolitan Hobby Guild* was held Jan. 10 at the Hotel Governor Clinton and the following temporary officers were elected to serve until a constitution is adopted: Chairman Irwin S. Polk; Secy. Albert L. Lewis; Treas. William Effinger Jr.; Sergeant at Arms Leon Shulman. The next meeting was held at the Martinique Hotel on Feb. 24 when the Constitution Committee under Mr. Robert Tagle submitted a draft of the new constitution and the committee was commended for doing an excellent job. It was decided to send copies of the draft to some 500 clubs, dealers, civic groups etc. for study and recommendations before final adoption at the next meeting.

THE DATE for the *Schnectady Aeroneers'* 8th annual regional model meet has been changed from May 25 to June 29.

PAUL HALLER, 146 Beach 74 St., Arverne L.I., N.Y. writes that he is a member of the recently organized *Rockaway Modelairs.* They have held two hand launched glider contests with the following results:

First Contest—1. H. Small; 2. B. Myerson; 3. L. Katz.
Second Contest—1. B. Myerson; 2. L. Katz; 3. F. Babbit.

They have a small membership and would like new members. Interested modelers are requested to contact Paul Haller.

ANOTHER NEW CLUB, the Albany *Fort Orange Modelaires,* recently elected the following officers: Pres. Tony Hyde; Vice Pres. Joe Nichols; Secy. Mrs. Kay Nichols. This club would like very much to challenge any other club around the Capitol area during the summer season. Interested clubs should contact Mrs. Nichols, Club Secy., at 724 Madison Ave., Albany 3.

Ohio

The *Cincinnati Albatross Birdmen* invite interested modelers to attend their meetings held on first and third Fridays of each month at Williams YMCA, 1228 E. McMillan St., Cincinnati.

Oregon

Results of the Tri Club Meet held Jan. 19 in Portland by *Salem Cloud Chasers, Salem Model Airplane Club,* and *Portland Gasshoppers,* are:

Senior Class A—1. Earl Cayton; 2. Dubarry; 3. Reese Boyd.
Junior Class A—1. Ed Knapp; 2. Ray Chalker; 3. Rex Bently.
Senior Class B—1. Rex Baumgardner; 2. Earl Cayton; 3. E. R. Nichol.
Junior Class B—1. B. Fletcher; 2. Dick Roberts; 3. Stan Ryder.

Senior Class C—1. Earl Cayton; 2. Dubarry; 3. Owen Brown.
Junior Class C—1. Rex Bently; 2. Graber; 3. Bob Hammond.

Pennsylvania

The *West Philadelphia Gas Model Club* held their Annual Banquet on Jan. 11, at which trophies were awarded to the following winners.

Free Flight—1. Warren Jacobs; 2. Jack Lenderman; 3. Al Miller.
Control Line—1. Harry Allison; 2. Dick Slutz.

A NEW CLUB, the *Anthracite Control-Liners* was organized last October from members living in the area surrounding Mahanoy City and Shenandoah. Sponsored by the Lions Club of Mahanoy City, they are planning to hold a Class A or AA control line meet in May or June. The club project for the month of January was a window display held in both towns. They would like to hear from other clubs in and around this vicinity; please write Carl H. Liachowitz, 29 W. Center St., Mahanoy City.

FROM LANNESDALE comes news of the new *Aero Sportsman's Club*. Kenny Hirst writes that prospects for 1947 look very good. Marvin High has a 7' Stinson radio control job; Bing has a 4' Hellcat with sliding canopy; and Steely is making a still larger P-51. Some of the newer members have become interested in gas models and are looking forward to a successful season.

South Carolina

The *Charleston Prop Busters*, a newly organized model club, held a contest recently with results as follows:

Free Flight (Rubber)—1. Ray Taylor; 2. Keating Simmons; 3. J. G. Reed.
Free Flight Gas—1. Jack Griffith; 2. Morrison; 3. Robert Gulow.
U-Control Class C—1. J. B. Carter; 2. Trox Caire.
U-Control Class B—1. Jimmie McCleary; 2. Norris Stevens.
U-Control Class A—1. Buddy Burns.
U-Control Precision—1. J. B. Lowndes; 2. J. N. Stevens.

Wisconsin

Charles J. Hein, Activities Director of the *Flying Badgers* of Fond du Lac reports that snow does not stop this club's activities—they merely equip their planes with skis and keep right on flying. Their research group plans to start a series of motor tests on March 9 including torque and thrust readings, compression tests, and strobotac checks. They will also try different types of props, flywheels and fuels. At present they have over a dozen different makes of motors to test and hope to have a number more by test time. Testing will be conducted in the laboratory of a local motor manufacturing plant and will be under the supervision of several engineers and supervisors of the plant. Photos and a complete record will be kept of test data.

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